***Protection Against Energy Thievery—Practises of Wide-Awake Companies in Guarding against This Loss***

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# Electrical World

New York, May 26, 1917 McGraw-Hill Publishing Co., Inc. Vol. 69, No. 21 10c a copy

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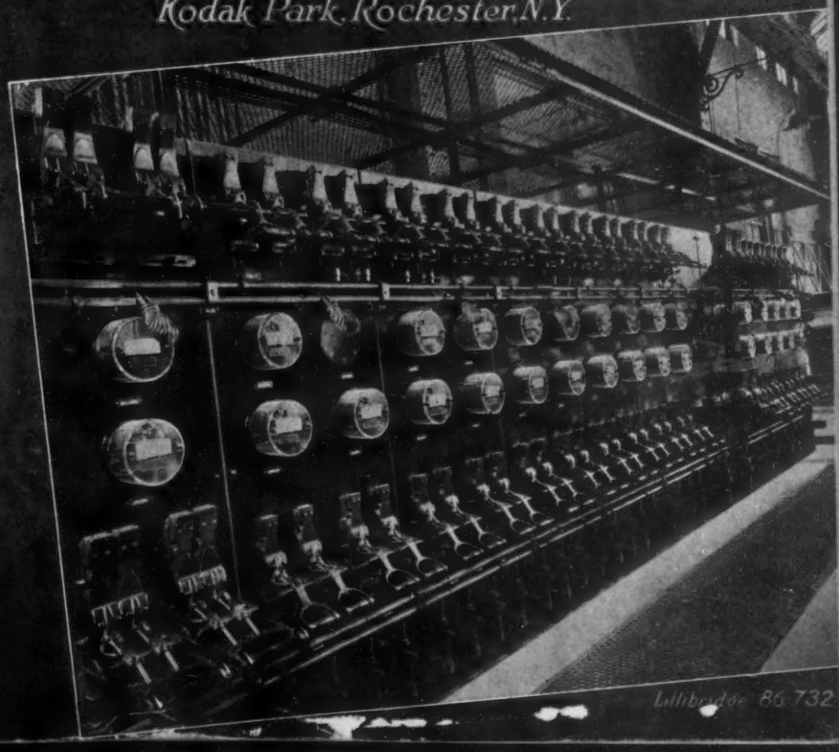

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# Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN
Published by the McGraw-Hill Publishing Company, Inc.

Vol. 69 NEW YORK, SATURDAY, MAY 26, 1917 No. 21

## The Theft of Energy

HOW to deal with the customer who deliberately steals energy is sometimes a troublesome question. A company does not like to keep in the courts with complaints, nor is it disposed to tolerate the existence of marauders on its system. As a rule energy stealing is comparatively frequent in large cities and rather rare in small places. Possibly there is no more difference in this respect than in the case of some other varieties of crime, but the fact is that the station working in a large city keeps theft down only at the cost of considerable vigilance. A discussion in our columns this week gives a useful clue to some of the indirect methods employed to restrict thieving without constantly rushing into courts. Fortunately, detection in such theft is almost certain. No considerable amount can be obtained surreptitiously without making a discrepancy between installation and meter reading evident to employees of the company, and those who attempt this fraud usually try it on a scale big enough to insure detection. Any suspicious case is run down so easily with a pole meter that the guilty can be caught very promptly.

Of even greater importance, perhaps, than the detection of the thief is the discovery of his confederates. Energy is not often stolen without the collusion either of an employee of the supply company or of a contractor who, for example, connects a garage or other outbuilding outside the meter. To catch the instigator of the crime is important, and sometimes under pressure of impending prosecution the information can be wrung from the thief himself. Usually there is no difficulty in getting adequate compensation for the energy actually stolen, but prevention rather than remedy is the thing most needed. Generally the laws are effective enough and the rest lies with vigilance.

## Watching Costs and Rates

EXTRAORDINARY operating costs are having an effect upon rate-making which may be far-reaching. Many reports to the ELECTRICAL WORLD tell of revised schedules for power rates. Back of the higher rates which companies are promulgating are higher costs which cannot be overcome by any superior operating methods yet devised. These expenses will not be dissipated by critical analysis. They affected financial results in 1916, in some cases seriously; they are having a profound effect upon current operations; they will influence the future to an extent that no one can foretell. If present conditions are to be regarded as a fair index of what the coming years hold, the rates of all central stations generating energy by steam will be altered.

An indication of the necessities which the companies face is given by the decision of the Cleveland Electric Illuminating Company. By the action of this company power rates for large consumers are raised 20 per cent. Great industrial activity and car shortage have fallen heavily upon properties in the Central West. It is not a question of recouping; it is a matter of protecting against excessive costs in the present acute demand and in the future. Old conditions of operating cost are revised for both central station and isolated plant. Both have to accept the war-time cost basis. Central station conservation is more essential than ever before, but the proud figures of low cost at the switchboard are no longer where they were.

Experiences in the last year are likely to cause a reconsideration of the entire problem of bulk supply and resale for the operation of what should be the largest consumers of the ultimate great central station—the railways. A fractional increase in unit cost is substantial when the margin is small. It may destroy the margin or make it so slight that a contract is no longer justified. In future contracts of this character the companies will be prudent if they take into account the possibility of a repetition of the present expensive contest with the coal situation.

## Correlation of Commercial Bodies

OUT of the sagebrush and deserts of Arizona, Nevada and New Mexico and from the fertile fields of California has come many a vision. Indeed, only a dreamer could see the relationship of snow-capped mountains and deep canyons to a distant civilization, and only a pioneer could have the hardihood to interpret the dream. Fortunately, many of the electrical dreamers and pioneers still live to see the fruition of their labors, and it was a happy coincidence that the Pacific Coast Section of the National Electric Light Association should have its first convention in the immediate vicinity of the early work of those daring engineers. Under so great an impetus it is but natural that the section should grow by leaps and bounds. Its membership includes practically all of the operating companies in the states of California, Arizona, Nevada and New Mexico and represents invested capital of close to half a billion dollars, possibly one-sixth of the total electric utility investment of the country, with a gross revenue last year of $50,000,000. In the territory there are seventy-three hydroelectric plants and thirty-one steam plants, with an aggregate rating of over 1,250,000 hp. —the total connected load approximating 2,000,000 hp. —7500 miles of high-tension transmission lines and 25,000 miles of distribution lines to supply about

525,000 consumers. Despite the wide expanse of territory and the scattered 4,000,000 population, no other section of the country can boast of greater diversity of electric application, larger ratio of meters per inhabitant, lower rates for energy and more economical generating costs.

The first convention of the Pacific Coast Section of the N. E. L. A. is now a matter of history, but the seed of a rather extraordinary situation which developed at Riverside during the meeting has begun to take root and may eventually result in a more comprehensive handling of the affairs of the electrical industry on the Pacific Coast at least. In attendance at Riverside were a large number of manufacturers, jobbers and dealers who contributed not a little to the success of the convention. They could not, however, participate in the proceedings, and it was felt that the attitude of the manufacturer, jobber or dealer who in the deliberations of the industry is obliged to sit on the outside while those representing other branches sit within cannot be so productive of good as if all sat together and conferred on each phase of the whole problem. Here, then, is the germ of a larger and bigger organization of which the central stations will be a part and in which they will have their own deliberations. So far, outside of the Society for Electrical Development, no attempt has been made to correlate the activities of the various commercial electrical organizations, although many have been suggested. Possibly the Pacific Coast can work out such an organization which may serve as the nucleus for a larger and national body. If the stress of war conditions should bring this about, it would be a great blessing.

## Keep Your Reflectors Clean

THE loss of light due to dirty reflectors is a very much larger item in illumination than most people realize. Persons interested in the general discussion of the subject will find Mr. Kegerreis' paper on the subject extremely suggestive. The theory of the matter in its approximate form is rather simple, the chief difficulty in its application being the determination of the experimental constants which vary so greatly from place to place, and probably from time to time at the same place, that accurate estimates are difficult. Perhaps the chief moral to be drawn from the discussion is that in the design of fixtures greater attention should be paid to facility of cleaning than is now common. At the present time when a large proportion of interior lighting is provided by indirect and semi-indirect fixtures the losses from lack of cleanliness are greater than formerly. Dust on the outside of a shade looks badly but is not particularly serious from the standpoint of illumination. Turn that shade, be it translucent or opaque, upside down and let the dust accumulate on the inside on the reflecting surface and the results at once become serious. Everything that raises the cost of cleaning raises the cost of illumination, either in labor or in electrical energy, if the fixtures are neglected. Fortunately with modern lamps the cost of energy is relatively small, but the lighting installation is usually designed on the theory that it will be kept in first-class average condition while the fixtures may be such as to reduce the light output by a third or a half after a comparatively short time. Hence any complaint of poor illumination should be investigated from the standpoint of cleanliness of the fixtures as well as from that of lamp renewals and proper voltage supply.

## Increasing Efficiency Through Superheat

IN DISCUSSING the tendency toward higher steam pressures in steam station practice last week we commented on the conservatism of boiler manufacturers in treating all high-pressure appliances as "special," with the usual result that such appliances command higher prices and are surrounded with all the uncertainties and difficulties of delivery and repair common to special goods. For this there is not much excuse; but there is even less excuse for the extreme conservatism in the matter of superheating that has held even up to the present time. A few years ago it was almost impossible to get a reasonable amount of superheating in American steam apparatus. A call for bids involving 200 deg. or 250 deg. Fahr. (93 deg. to 121 deg. C.) of superheating was almost invariably met by a long-winded letter to the effect that "Our chief engineer does not consider it wise to attempt more than 125 deg. Fahr. (52 deg. C.) at the outside. Anything beyond this must be regarded as uncertain and dangerous practice for which there is no good precedent," and this in face of the fact that double the figure named had been customarily in use for some years past almost anywhere abroad.

Time has broken down even the conservatism of the unready, and, as the N. E. L. A. report shows, big stations are drifting to superheat of 250 deg. Fahr. (121 deg. C.) and pressures of not less than 250 lb. (17.6 kg. per sq. cm.). Indeed, there is a strong tendency to work to even higher pressures. The boiler makers are conservative as usual, blandly throwing cold water on the high-pressure proposition. They are talking in just the same terms now that they used regarding 250-lb. (17.6 kg.) pressures ten years ago, and whether with any better reason remains to be seen. There is undoubtedly a point, as boiler engineers well know, beyond which increase in economy does not pay the overhead charges. At just what figure this is reached, particularly when one considers high superheat as an alternative, no one can as yet say, but with the terrific increase in the cost of fuel it is certainly up to designing engineers to find out exactly this thing and to do it at once. It may be that 250 lb. to 300 lb. (17.6 kg. to 21.1 kg. per sq. cm.) pressure with high superheat is the figure of maximum economy, or that figure may lie 100 lb. or 200 lb. (7 kg. or 14 kg.), or as many degrees, higher. The drift of thought in engineering practice, however, is perfectly clear. It is working steadily toward maximum thermo-dynamic efficiency obtained by the use of big units and by the employment of the greatest feasible temperature range in the prime mover. Ten or 15 per cent saving in the coal bill with

coal at $2 a ton ($2.20 per metric ton) is not worth a very heavy expenditure. With coal at anywhere from $5 to $10 a ton ($5.50 to $11 per metric ton) the situation changes with appalling rapidity, and all our previous notions must be revised. The encouraging feature of the situation is that some of the boiler makers are facing the problem courageously, despite the timidity of others, and under the stress of necessity the demand for improvement may be promptly met. Certain it is that fuel conditions demand a higher degree of efficiency than has ever been before attempted, and these conditions, thrust upon us by temporary stress, are, if experience may be taken as a guide, more than likely to acquire permanence.

## Cheap Hydroelectric Power

AS OUR readers know, electrical energy is about the only thing which has steadily fallen in average price through a period of unexampled inflation in the cost of necessities. In a very suggestive article Mr. Hoar brings forward the optimistic proposition that it is going to be practicable to reduce power rates from hydroelectric plants still further and thus to extend a helping hand to growing industries while gaining profitable business for the supply companies.

In considering any such question it must be fully realized that our present conditions are highly abnormal. We have to deal not only with the ordinary growth of manufacturing but with industries which directly or indirectly depend immediately on the existence of war conditions and upon the industrial changes which these may bring about even after the termination of hostilities. Mr. Hoar very properly lays emphasis on the special characteristics of such industries, especially the feature of unknown permanence which renders them less desirable customers than the ordinary classes.

It is undoubtedly true, as he indicates, that in some cases very low rates can be made profitably to certain consumers, but we do not see how, under present conditions, power prices can take a strong downward tendency. The expenses of supply companies are steadily increasing. With copper at 30 to 40 cents and aluminum jacked up to nearly equivalent figures, with electrical machinery at considerably enhanced prices, labor calling for greater returns, and coal for auxiliary service frequently held at exorbitant figures, the product of the central station cannot be expected to fall in price.

While it is absolutely correct, as Mr. Hoar shows, that in many instances very low figures by the horsepower-year or some equivalent method have been charged with profit to the supply company in the past, it is equally true that many a station with long-term contracts of this kind has found itself very gravely handicapped in taking on more profitable business, particularly after the point is reached where auxiliary steam power must be used more and more. During the early stages of development in a hydroelectric property before the peak load has reached the full capacity of the station, costs of operations are almost independent of the load and consequently power supplied even at a very low rate is a temporary advantage. It is not a far-sighted policy, however, to load up a station for the sake of temporary benefits at a price which, at a later stage of operations, will inevitably prevent the sale of power at a rate adequate to allow for the considerable use of auxiliary steam.

The true criterion of equitable rate for large blocks of power is not the effect of the total payments in helping out running expenses at the beginning, but the final effect of the particular load proposed on the load factor and the diversity factor of the plant. A large and steady customer may be very advantageous or exactly the reverse according to the relation of his load requirement to the general service of the station. Far too great attention has been paid in the past to quantity demand, and far too little to the relation of the demand in point of time and quantity to the general service. The maximum demand method of reckoning, now fortunately lessening in popularity, was and is a dangerous source of error in that no account is ordinarily taken of the time relations of the maximum. A maximum demand of 1000 kw. between 3 and 6 o'clock in the morning is a very different proposition from the same quantity between 3 and 6 o'clock in the afternoon, and the difference tells most vitally in the case of hydroelectric plants with limited capacity.

The moral seems to be that each case must be considered by itself, and provision should be made in station practice and in commission rulings for such study of individual conditions as shall show whether a large consumer of power can be, or cannot be supplied profitably from a given system.

## The Coming Issues

UNTIL recently, it is surprising to say, comparatively few factory managers have appreciated the value of adequate illumination in their plants. In many cases the lighting equipment has been looked upon only as an aid to night work and production during the dark hours of winter. If adequate illumination is not furnished the efficiency of workmen will be decreased, the product developed will not be of the best quality, production will be reduced, accidents will be more prevalent, etc. In an article to be presented next week, C. E. Clewell will point out other reasons why factory owners should give more attention to lighting. In addition he places a dollar-and-cents value on good lighting and shows how the expenditure for adequate lighting equipment can be more than offset. Some very convincing arguments for better illumination will also be presented which have been collected from factory workers, foremen and managers. The subjects treated should be of interest to central station companies in developing their lighting service business. Unusual interest attaches to the monthly compilation of central station revenue and output, which will be published in the issue of June 2. Many conflicting influences affect business in different sections of the country and the gradual development of these will be revealed authoritatively by the ELECTRICAL WORLD statistics. The characteristics of and field for different types of oil engines will be discussed in the second issue of June.

# How to Detect and to Deal with Electricity Thieves

## Methods and Practices That Central Stations in Every Part of the Country Have Found Valuable in Making Collections and in Stopping the Theft of Electric Energy

IF A man steals electricity his chance of being detected is splendid—about 100 per cent sure. Furthermore, it is very sure that he will pay in full for the energy stolen. An inquiry conducted by the ELECTRICAL WORLD shows that while there is leniency among central stations generally in the matter of demanding full legal prosecution of the electricity thief, there is absolutely no disposition to let him escape without paying well for the service he used.

In fact, the canvass of the situation indicates that about 20 per cent of the companies which have thievery to deal with favor full legal action, while the remaining 80 per cent for various reasons favor collecting money from the malefactor without process of law. Where prosecution is favored it is usually a last resort, adopted in a territory or a community where to stop increasing depredations examples must be made of those who are caught. Such situations rarely arise in the smaller cities. In fact, companies in cities of 10,000 population and less have but few cases of energy stealing to deal with and can usually adjust matters satisfactorily with the culprit outside the courts. When it is necessary to resort to the law, however, some companies find themselves more fortunately situated than others in that adequate statutes are provided in some states and are not in others. In many states, because of the wording of the laws, it is difficult to secure sufficient evidence to guarantee conviction.

### METHODS FOLLOWED IN THE FAR WEST

There seems to be a particularly effective law against stealing energy in the Far West. From this region one company writes: "In this city of 300,000 people we collected $1,014 from eighty-seven offenders in 1916; we obtained ten convictions and lost only one case (a woman) after three trials. It is our practice, if the offender is willing to pay for the energy plus a charge for special inspection, to collect our money and drop the case. If he denies his guilt and refuses to pay, he is arrested and tried in the police court, the prosecution being carried on through the corporation counsel's office." Another Pacific Coast company which has tried diplomacy and cash settlements with no lasting effect now arrests and prosecutes everyone caught stealing energy. The company's own attorneys, getting permission from the prosecuting attorney, handle the cases. The usual fines have been $25 and costs, or $42. In some cases fines of $50 and costs were obtained. One Coast concern serving a large territory has a policy of prosecuting energy thieves to the full extent of the law.

Because of the knowledge of the public that there is little chance of injury from wires carrying electricity for lighting, there has been a gradual increase in thefts of energy on this company's lines. About a year ago it decided, therefore, upon a strenuous campaign against these offenders. Now not only are these cases prosecuted but a full account of each case is published in all daily newspapers. When the campaign was started the attention of the courts was called to the fact that energy thefts were on the increase. The courts co-operated with the company by increasing the penalties. It had previously been the practice of the courts to fine the offenders a sum from about $10 to $25, but recently fines as high as $300 were assessed. In one case after the court assessed a fine of $300 a civil suit was brought for the energy used and the full amount of judgment was awarded as prayed for, $278 plus costs. This case cost the offender, after he had paid his fine, the cost of energy and his attorney's fees, approximately $800. In another case recently an offender was given a straight jail sentence of three months, which he served, in addition to being compelled to pay $78 for the energy stolen. Both of these cases, as well as many others, were given widespread publicity through the newspapers, with the effect that there are now very few cases of energy theft.

### HOW TO CONCEAL A POLE METER FROM A SUSPECT

Other companies deem it advisable "to make a peaceful settlement with the customer." The practice in such cases as outlined by one company is to send at least two employees to the premises in question and remove whatever has been done to tamper with the circuit. This is done if possible in the presence of the consumer, who later is notified to call on the company's general agent. If he refuses to call, he is further notified that unless he calls within a specified time he probably will have to call at the police station. Invariably he calls. The matter is talked over and he receives an opportunity to settle with the corporation for all of the energy which it is figured has been stolen. He is advised to make the settlement in order to save himself the publicity of having his name mentioned in the papers as having been arrested for stealing, and generally he "comes through" very gracefully.

Where a consumer is suspected of stealing energy by some means which this company is not able definitely to determine, the meter is connected in series with a meter in an old transformer case, as shown herewith. This concealed meter is hung on a pole as close to his premises as possible without his becoming aware of what is being done. After the meters have run in series for ten days a box is put around the meter in his house and locked up; then the meters are allowed to run in series for another week or ten days. With this evidence at hand this company feels that it is sufficiently fortified to insist upon the consumer coming to its office, where he is accused of stealing energy and asked to settle.

Another company which follows practically the same procedure as to settlement had been disconnecting service as a means of bringing the offending customer to the office. The reason for abruptly discontinuing service under these circumstances is given as follows:

"As soon as theft of current is discovered we immediately disconnect service and take no immediate steps to approach the consumer. Owing to the fact that the lights of one who was a very free user of service have

been turned off the neighbors are inclined to gossip about it. The consumer usually calls on us within two or three days, and we then present him with what appears to him to be very incriminating evidence. He is told that the matter is a very serious offense and that our legal department is considering prosecuting him, but if he will call within a day or two we will give him definite information. We purposely postpone immediate settlement for several days, during which time the consumer becomes very anxious for reconnection of service and fearful of prosecution. He is then about in the right frame of mind to pay the estimated bill. By following this practice we have been uniformly successful in collecting for stolen energy."

### STAGING A "SCARE" TO MAKE COLLECTION EASY

Companies operating in states the laws of which do not adequately protect against energy thefts have had to devise clever means of collecting for stolen energy

FOR CATCHING THE ELECTRICITY THIEF A METER IS MOUNTED ON A POLE WHERE IT CAN BE CONNECTED IN SERIES WITH THE METER

A section of the transformer case can be sawed out and the opening covered with a large name plate to facilitate the work of reading this concealed meter.

and preventing recurrence of the theft when the miscreant is discovered. One company, because it has not been able to obtain convictions, now contents itself with removing the house meter and replacing it by a meter on a near-by pole. Another company, operationg in a town of 5000 people, reports that it keeps on hand twelve boxes with meters installed in them. One of these can be installed on a pole at a cost of 50 cents. These twelve meter boxes have been found to be a paying investment. Others have tried discontinuing service, then tried pole meters, but are giving up this practice in favor of meter protective devices. In some cases the companies in collecting for the energy stolen add an amount sufficient to cover the cost of protective devices and in this way make the customer pay to prevent himself from repeating the robbery.

Another method of restraining a suspicious customer from repeatedly making unauthorized connections is outlined by a Southwestern company as follows:

"Following an agreement of willingness on the customer's part to pay for unregistered energy, we try to have him sign a statement in substance as follows:

> This is to advise that I have been using electricity from the wires of your company at ..... Street which has not registered on your meter. I have known that I was securing electricity in this way, and I herewith tender you $.... in settlement for the electricity so used.
>
> Name.....
> Address.....

"We feel that a statement of this character in our possession should at least have a restraining influence against the culprit attempting further theft of electricity. In the event that the signer should attempt a further theft, this statement would—should it be desirable to do so—be helpful in filing civil proceedings."

With the great majority of central stations, which desire not to prosecute electricity thieves, mainly because of the unfavorable public relations that might result, the problem is one of frightening the offender sufficiently to make collection for energy used easy. With this in mind, one lighting company gets the local prosecutor to send for the miscreant, to give him a "good talking to"—a scare. Then newspaper publicity, without mentioning any names, is obtained for the case. The item is also given out through the prosecutor. There is no arrest, no prosecution. The company believes the advantages of this plan are obvious.

In one community, after the contract department has explained the enormity of the offense with all the force the "star" salesman can muster, the accused person is handed a copy of "Senate File, No. 259—An Act to Prohibit the Theft of Electric Current, April 10, 1910." The extended legal phrases of this document, it is said, aid in collecting a bill based on "a rather liberal estimate of the energy appropriated." It has been found in a city of 15,000 in the West "that the most effective remedy for electricity stealing is to present a bill for $50, sending it to the offender by registered mail. The bill reads as follows:

> For electricity consumed for an indefinite period not registering through the meter.....$50.00

This practice when it was adopted soon became well advertised among the energy-stealing public and practically eliminated the trouble."

It is a favorite practice in many places when a theft is first discovered to secure informally the services of a police officer. While the company's representatives treat with the miscreant in his house, the officer strides conspicuously back and forth in front of the residence. Another company sends a local police sergeant to make the collection. His brass buttons and gruff manner automatically cause the proper scare. It is the practice of a utility serving several small cities in New Hampshire to secure a warrant for the arrest of the one who made the connections and to take him before a local lawyer on this warrant, which by arrangement made beforehand with the sheriff is not served. The company has the lawyer appear for the man. The company's representative states the case before the sheriff and the lawyer. The lawyer advises his client to make a cash settlement and collects a fee for himself and the sheriff. In another city served by a municipally owned plant all cases are settled by collecting the amount due in secret sessions of the local Board of Public Utilities. Some companies in Eastern cities have found it effective to complain to the fire marshall when wiring was tampered with. In such cases this official proceeds against

the thief on the basis that his action is a menace to lives and property and that a serious fire might have resulted from the "defective" wiring. In many cases photographing the unauthorized connections is resorted to in order to make a display of seemingly incriminating evidence when the customer is approached for collection.

In the very large cities it is generally necessary for companies to maintain a special department which among other things handles all cases of electricity stealing. This department in one city receives from the meter-testing, inspection and other departments 250 "leads" a month. No cash offer is made for these leads in this particular city, but offers as high as $15 are made to employees of some companies for such information. The company in question investigates all suspicious circumstances, and in 80 per cent of the suspected cases there proves to be nothing really wrong. The other 20 per cent, however, bear further investigation. Through the operation of this department, requiring the part-time services of five men, the company recovers $650 a month, or about $150 more than it costs to operate the department. The detail procedure of the department is as follows:

### How to Keep a Constant Watch on Suspects

When the lead is received, the name, address and peculiarities are entered on a card. This card is kept in a file until the case is investigated. If evidence of theft is discovered, the department tries to collect an amount equal to the price of energy used plus the cost of investigation and collection. It resorts to prosecution only in extreme cases. On cases in which theft is discovered another card file is kept. It contains a continuous record of monthly meter readings. Should the readings fall off for any three consecutive months, a reinvestigation is made. This file is an accurate check on the action of any customer who has been found to know how to steal electricity.

It has been found by this company that certain classes of people are the worst offenders. Among these are saloonkeepers, who usually dispense drinks to linemen or wiremen for making an unauthorized connection; dentists, who because they possess mechanical ability, tools and leisure tamper with the meter itself, and janitors who make a practice of doing wiring for apartment dwellers. It is also said that the man who advises the company's employees to beware of his cross dog will bear watching. Another source from which trouble may be expected is the wired but unconnected house.

Broadly speaking, it seems to be the opinion of central stations that it is not good policy to prosecute electricity thieves if a proper collection can be made and if sufficient publicity can be given to this collection to deter others from trying the same scheme. While it is not the general practice, it seems that a constant but inoffensive watch should be kept on everyone who has ever been an offender. One concern marks meter cards of such people with a "W" in a 1-in. red circle. This warns the meter-man to be on the watch. Where an "epidemic" of stealing is encountered, however, it seems to be necessary to make examples of some of the offenders to stop the growth of unauthorized use of electricity. What is perhaps the most optimistic note in the whole situation comes from a Georgia company, which says: "Since Georgia has become a prohibition state the saloons—the worst offenders—are eliminated."

## METHOD FOR TESTING INSULATION

### New Method Based Upon Discovery of Effect at High Voltage Tests of Presence of Moisture

Results of insulation-testing investigations have been made the subject of a method patent (No. 1,212,467) issued to Sidney Evershed, who is with the firm of instrument makers, Evershed & Vignoles, Ltd., London, England. This step is rather remarkable in that no new type of instrument is involved in the claims.

The basis for one claim rests upon the discovery by research that one of the causes of the relatively low resistance of insulations when tested at high voltages is the presence of moisture in absorbent insulating materials in the form of drops and thin films which form leakage paths for electric current. When an insulator in that condition is subjected to electric pressure the propelling force known as electric endosmose drives water out of the drops in the films, thereby increasing their thickness and decreasing the resistance of the leakage paths.

If the electric pressure is gradually increased the insulation resistance of absorbent materials falls, rapidly at first, but more and more slowly as higher pressures are attained. The relation of voltage to insulation resistance may be expressed by a smooth curve which is convex to the base line from which resistance ordinates are measured, so long as the endosmose or film effect is the principal factor in determining its shape or law of curvature. Ultimately, if the increase in voltage is continued, the curve passes through a somewhat undefined point, or region, of inflection, and then begins to bend downward toward zero resistance, the curvature rapidly increasing until actual breakdown occurs. The complete characteristic curve, as it may be called, therefore consists of two parts of opposite curvature joined at a point or region of inflection, indicating the growth of a dangerous mode of leakage which ultimately ends in a breakdown of the insulation. These two significant parts of the curve may be referred to as the "film curve" and the "breakdown curve."

The law expressing the shape of the film curve is much the same for all absorbent materials, provided they do not contain more moisture than they can harbor in the form of drops and of thin films. Changes in the number of films acting in parallel do not affect the safety of the insulation, nor do they alter the law of the curve although an increase or decrease in the number of film paths necessarily lowers or raises the general level of the curve. Hence so long as the shape of the first part of the characteristic curve indicates conduction by films, the general curve level is unimportant. On the other hand, the presence of an excessive amount of moisture, particularly when it is in the form of local accumulations of water in bulk, is liable to produce a dangerous condition. This is due to the extensive electrolytic action which takes place under such conditions if the excess of water is not detected and removed before the conductors and insulating materials have been seriously damaged. Leakage conduction of this kind follows Ohm's law, since the resistance does not vary with the voltage, therefore the characteristic curve would follow a straight-line parallel with the base line. Hence the shape of the first part of the characteristic curve enables prompt discrimination between safe and dangerous modes of leakage through damp insulating materials.

# Collection of Delinquent Accounts

## Outline of Results Obtained by Means of Competition Between District Offices—Employment of Young Attorneys Found Effective —Inadvisability of "Bluff" in Threatening Cut-Offs

BY LEWIS A. MCARTHUR

General Manager Pacific Power & Light Company

A DELINQUENT account is not necessarily a bad debt, but it frequently winds up in that class, and it is very desirable from the point of view of an executive of any central station to see that the man in the field is doing his utmost to keep down the amount of delinquent accounts.

In most central stations in the average-sized and smaller communities service bills are due on the tenth of the month following the period of service, and frequently discounts are given to persuade customers to pay within the ten-day period. Most companies do not generally consider accounts actually delinquent until the books are closed again at the end of the month, thus calling all accounts active that are outstanding for a period of less than thirty days from the date of billing. Some companies consider their uncollected accounts delinquent on the eleventh of the month after service or on the day immediately following the end of the discount period.

### KEEPING TRACK OF DELINQUENCIES

The most effective method of keeping track of the amount of delinquent accounts is to compare it with the total annual gross earnings. Of course the actual percentage will vary with the territory occupied by different companies and the type of people served. The Pacific Power & Light Company has made some interesting examinations into the question of delinquent accounts and the best method of clearing them up.

In January, 1916, a table was made of all the district offices, this table showing the percentage of delinquency at each place. These percentages varied all the way from 0.42 per cent to 19.2 per cent. The first-named community was one that was well off and the business was not scattered. The other community was in a very extensively irrigated district where farmers' accounts had to be carried for a considerable time before they were paid. Only two branches showed above 5 per cent of their gross earnings as delinquent, and most of them ranged round 1 per cent to 2 per cent.

### PRIZES OFFERED TO KEEP DOWN DELINQUENCIES

A prize of $15 was offered to the district manager who should during the following year proportionally reduce his percentage of delinquency the most. In addition to that, two special prizes were offered to the men who should do the best general work, taking into consideration not only the proportional reduction in delinquencies but also the amount of money collected. The branches varied so much in size that the proportional method had to be adopted in awarding the first prize.

During the ensuing year the district managers were urged every month to keep after their delinquents. The traveling auditors went over the delinquent reports from month to month, and they were also checked up in the general offices in Portland. The most effective method of collecting was to get some rising young attorney in the country towns to go after the bad accounts on a commission basis. This method always brought returns. Letters from the company gave less satisfaction. Personal calls were found to be effective. Discontinuance of service in extreme cases was found to be highly satisfactory.

By the middle of the year the branch that had stood at 19.2 per cent had been reduced to 9.13 per cent and the other reductions had been in proportion. At the end of the first year there was no amount that stood over 13 per cent delinquent and there were six that were less than 1 per cent delinquent. All branches with the exception of two were less than 2 per cent delinquent. The actual reduction in dollars and cents amounted to about 33 1/3 per cent. This work is being kept up every day and is still producing good results.

TABLE OF DISTRICT OFFICES SHOWING PERCENTAGE OF DELINQUENCY AT EACH DURING COMPETITION

| Office | Jan., 1916 | Aug., 1916 | Nov., 1916 | Jan., 1917 |
|---|---|---|---|---|
| Vancouver | 2.03 | 0.743 | 0.69 | 0.39 |
| Pendleton | 0.88 | 0.93 | 0.73 | 0.54 |
| Walla Walla | 0.84 | 0.775 | 0.80 | 0.58 |
| White Salmon | 3.71 | 1.66 | 0.87 | 1.45 |
| Dayton | 0.78 | 1.38 | 1.06 | 0.46 |
| Prosser | 0.86 | 1.15 | 1.26 | 0.95 |
| The Dalles | 0.42 | 0.905 | 1.39 | 1.44 |
| Lewiston | 1.59 | 1.15 | 1.47 | 1.72 |
| Pomeroy | 1.26 | 1.74 | N.R. | 0.85 |
| North Yakima | 1.57 | 1.58 | 1.97 | 1.73 |
| Goldendale | 1.52 | 2.33 | 2.38 | 2.43 |
| Astoria | 1.50 | 1.25 | 3.35 | 1.49 |
| Hood River | 1.71 | 2.86 | 3.90 | 5.00* |
| Sunnyside | 4.90 | 3.70 | 4.20 | 2.38 |
| Toppenish | 5.81 | 5.53 | 4.69 | 2.33 |
| Pasco | 19.20 | 9.13 | 13.35 | 12.80 |

*Estimated.

We feel that the use of young attorneys is desirable. We mail cut-off notices where that course seems necessary, and in every case a cut-off actually takes place on the date indicated in the notice. We do not send out cut-off notices as a bluff; that method has been proved to be ill advised and accomplishes nothing. One of the best ways to keep on the look-out for bad debts is to make careful examination of customers' credits before services are connected, bearing especially in mind that frequently a customer will come back to a community where he has lived before and where he may owe the light company a small balance. We have card indexes of our bad-debt customers for a number of years back, and every time a person applies for service we check him up on the bad-debt register to see if he owes the company anything.

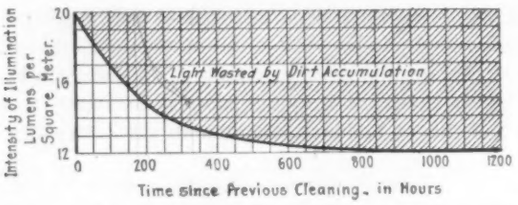
We find that less than one-half of 1 per cent of our gross earnings finally are charged off to bad-debt accounts. This we consider to be a fair record in a business badly scattered and dealing with many farmers who receive their income only once a year.

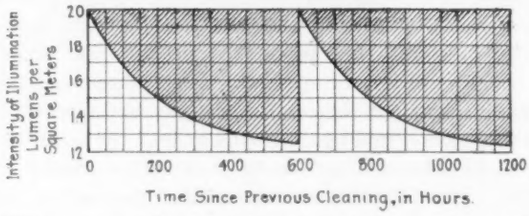
# Costliness of Light Absorption

## Importance of Preventing Dust Accumulation in Lighting Fixtures, Graphical Method of Determining the Most Economical Frequency for Cleaning, and Data Based on a Specific Case

BY ROY KEGERREIS

THE cost of good illumination is practically insignificant compared with many of the other running expenses of a factory or office, but there is perhaps no other item in the current expense account which so vitally affects the successful operation of an establishment. One of the chief benefits which are derived from good illumination is that the quality and quantity of the workmanship are increased. It has invariably been found that the wastage due to spoiled work is greatly decreased upon the institution of scientific illumination. Increased cleanliness is usually one of the direct results of improved lighting conditions. Many businesses are carried on with a small margin of profit, and it is therefore manifest that even a little saving on an item which may involve only a small percentage of the entire business will very materially make itself felt in the net profits.




FIGS. 1 AND 2—LIGHT WASTED BY ACCUMULATION OF DIRT WITH DIFFERENT INTERVALS BETWEEN CLEANING OF FIXTURES

The light from lamps deteriorates because of the collection of dirt on the light transmitting or reflecting surfaces, and also because of an inherent falling off in the luminous output of the lamp (due to blackening of the bulb in the case of incandescent lamps). Neither of these causes can be eliminated, but the effects of the first may be minimized by correct maintenance and cleaning, while the second may be lessened by proper renewal after the efficiency has fallen to such a value that it is most economical to discard the light-giving unit and replace it with a new one. Two distinct problems are thus involved, in that it is necessary to determine the useful life of a lamp and the proper frequency of cleaning. Considerable study and attention have been devoted to a complete analysis of the former problem, but the latter has been somewhat neglected. In what follows the writer will endeavor to present some definite data on it which should be of service in securing the most light for the least expense.

The light which is given off by a fixture is decreased by the accumulation of dirt. With most lamps it is dependent only on the time since the last cleaning and has very little to do with the actual number of hours which the lamp may be in use. The electric arc and gas lamp are exceptions to this statement to a certain degree. The one criterion for all comparisons and calculations of illumination is the useful light obtained. It is the product for which the money is ultimately spent and should accordingly be the basis for cost comparison. Fewer or smaller well-maintained lamps should be used, rather than permit an installation to be operated inefficiently.

Data for a typical case are given in Fig. 1, and from this it is apparent that there is a rather rapid falling off in the efficiency at first, after which practically no further decrease takes place. The shaded area between the curve and the horizontal line through its starting point represents the light which is lost because of the accumulation of dirt. The cost of this light gives the financial loss which is due to the dirt accumulation. If the fixtures were cleaned once during the time over which the graph extends, the area which represents the wasted light would be materially decreased, as is indicated by Fig. 2. It is thus apparent that much light may be saved by cleaning, but the cleaning involves an expense, and so the general problem of determining the most economical number of cleanings presents itself.

The most economical frequency of cleaning is dependent on the cost of the cleaning, the cost of the light and the form of the dirt-accumulation curve. The problem may be solved after these three factors have been determined, which may be done quite accurately for any given case if sufficient care and expense are directed toward their determination.

Two obvious methods may be used—the mathematical and the cut-and-try method. The latter is accurate enough, but becomes quite tedious since the process is somewhat involved because of its complicated nature, as may be inferred from the following solution.

The physics involved in the absorption of light by the constantly accumulating dirt and the form of the curve suggests that the graph is exponential. It becomes asymptotic to a horizontal line, and it accordingly follows that any law of variation which may govern the curve is very probably dependent only on the part of the ordinates above the horizontal asymptote. Fig. 3 results if the difference between the ordinates of the curve and the ordinate of the horizontal asymptote are plotted against time on semi-logarithmic paper, the logarithm of the ordinate differences being plotted on the ordinate scale. The resulting straight line conclusively shows that the curve of Fig. 1 is exponential.

A general form of the equation for the illumination efficiency curve is $y = a + be^{cx}$, the constants of which may be determined. By inspection $a = 12$, so when $x = 0$, $a + be^{cx} = a + be^0 = a + b = 20$, therefore $b = 8$.

The quantity $c$ may now be determined by selecting a suitable point and equating the ordinate at the point selected to $12 + 8e^{cx}$. Taking a point at $x = 150$, where $y = 15.75$, this equation reduces to $12 + 8e^{150c} = 15.75$, or $e^{150c} = 0.47$ and $150c = \log_e 0.47$. The second member $= \log_e 4.7 - \log_e 10$; therefore $c = -0.0050$. The equation for the curve of Fig. 1 is then $y = 12 + 8e^{-0.0050x}$, where $x$ is the time in hours which has elapsed since the previous cleaning.

The horizontal line to which the curve of Fig. 1 tends to become tangent represents what the light production would be if the fixtures were never cleaned—which is a very common case in many places to-day. The area between this asymptote and the actual performance curve then gives a measure of the light which is saved by cleaning. The next step is to obtain an expression for the relation between the light saved and the time between cleanings, the obvious expression being:

Lumen hours saved per year per square meter =

$$k/24 \left[ \int_{x=0}^{x=g} 8e^{-0.0050x} dx \right] \frac{8766}{g}.$$

$k$ = average hours that the lamps are in use per day, $g$ = hours between cleanings, and 8766 = hours in a year, which is taken as the time period for comparison.

By integration a more workable expression can be secured for the relation between the frequency of cleaning and the saving which results therefrom:

Lumen hours saved per year per square meter =

$$k\left(\frac{584{,}400}{g}\right)(1 - e^{-0.0050g}).$$

Fig. 4 gives the curve for this equation, with the value of $k$ taken as twelve hours. The value of the light which is saved by the cleaning may be found by multiplying the expression for the light by the cost of a unit amount of light.

Saving per year per square meter =

$$k/g\,(584{,}400)\ (1 - e^{-0.0050g})\,0.0016 \text{ cent}$$
$$= k/g\,(935)\ (1 - e^{-0.0050g})\ \text{cents}.$$

The curves of Fig. 5 gives the criterion for determining the most economical number of cleanings to give the lamp fixtures. The saving in cents per square meter per year which is effected by the cleaning is then equal to

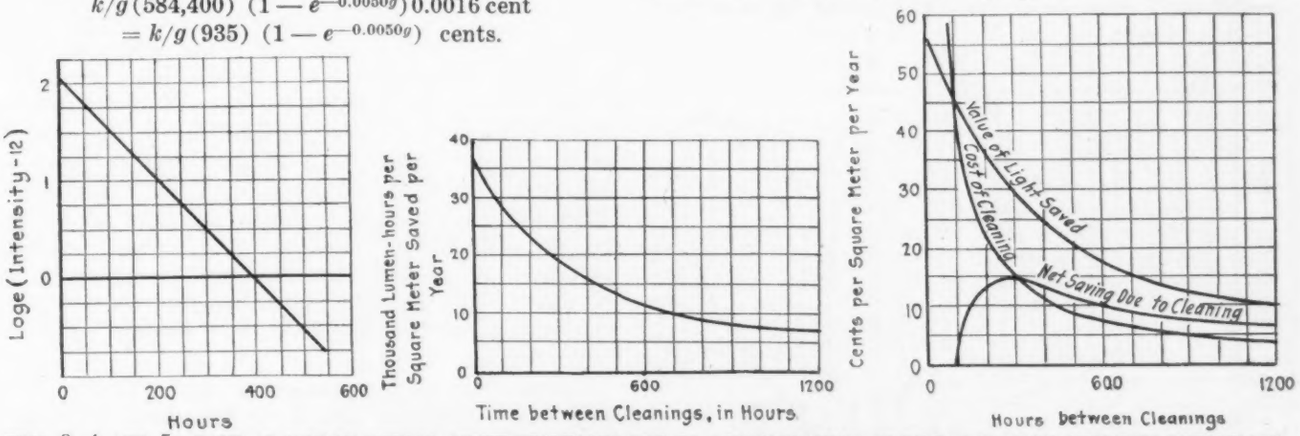
$$\left\{\left[k/g\,(935)\ (1 - e^{-0.0050g})\right] - \left[\frac{8766}{g}\ (0.5)\right]\right\} \text{cents}.$$

The third curve of Fig. 5 represents the preceding equation graphically. The most economical conditions exist when the time period between cleanings is such that the positive difference between the saving due to the cleaning and the cost of the cleaning is a maximum. This condition corresponds to the top of the hump in the curve. This is the desired answer to the solution, and not only gives the proper time which should separate successive cleanings but also shows the saving which will result with such a frequency of cleaning. The expense of the lighting will be higher than it should be if the cleaning is done less often because of the excessive cost of the light which is lost in the accumulation of dirt, and it will also be higher than it should be if the cleaning is done oftener than is indicated by the hump of the curve because the cleaning will then cost so much that the maximum saving cannot be effected.

The curves of Fig. 6 are exactly similar to the foregoing except that different hours of burning per day are assumed. The variation of the position of the desired maximum point with different hours of burning may be found by equating the first differential of the equation of the curve with respect to $g$ equal to zero. The resulting equation is—$935k/g^2 + 935k/g^2(e^{-0.0050g}) + 935k/g\,(0.0050e^{-0.0050g}) + 4383/g^2 = 0$. Multiplying by $g^2/935$ and equating to $k$, the result is

$$k = \frac{4.7}{1 - [e^{-0.0050g}(1 + 0.0050g)]},$$

the curve of which is shown in Fig. 7. It will be noted that this curve becomes asymptotic to the vertical




FIGS. 3, 4 AND 5—RATE AT WHICH USEFUL LIGHT DECREASES DUE TO ACCUMULATION OF DIRT; RELATION BETWEEN FREQUENCY OF CLEANING AND LIGHT SAVED; AND VARIATION IN COST OF CLEANING WITH FREQUENCY OF CLEANING BASED ON LAMPS BURNING TWELVE HOURS A DAY

The curve for the saving which results from the cleaning shown in Fig. 5 is exactly like Fig. 4 with a different scale along the ordinate axis, since the equation of the curve of Fig. 4 has merely been multiplied by a constant, the cost of a unit amount of light.

It is evident that the cost of cleaning will vary inversely as the time between cleanings. The equation which represents the cost per year for cleaning a square meter of floor space is then $y = (8766/x)0.5$ cent. This equation represents a hyperbola, as is shown by the resulting curve in Fig. 5. The relation between these two whose abscissa is 4.7 hours. This shows that cleaning is unprofitable when the lamps are used less than 4.7 hours per day since the most economical time goes to infinity at this ordinate.

It is now possible to plot Fig. 8, which shows the maximum saving which may be realized for different hours of burning per day. This curve, as well as the previous one, very plainly indicates that a rather paradoxical condition exists when the lamps are used only a few hours per day—*i.e.*, it is more economical to operate the installation without cleanings, at least except at

extremely infrequent intervals, which would be of the same order as the general cleanings the interior as a whole would get.

Individual lamps vary in efficiency throughout their life. It is assumed, however, that any system to which these methods of analysis would be applied has been in service for a sufficiently long time for the diversity in

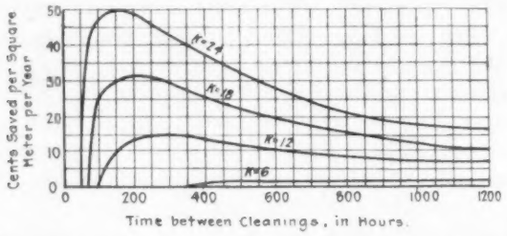
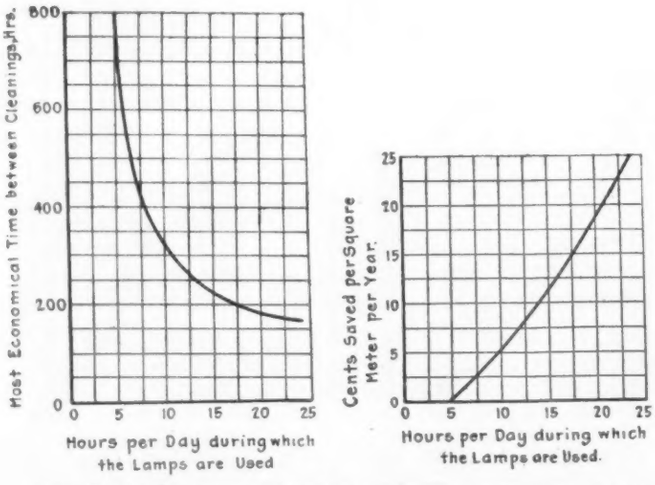



FIG. 6—SAVING POSSIBLE WITH DIFFERENT FREQUENCIES OF CLEANING BASED ON DIFFERENT HOURS' USAGE PER DAY

the renewal of the different units to have caused all parts of the life curves to be represented. If the system has not been in operation for a sufficiently long time, so that the average conditions may be realized, it is obviously necessary to make allowance for the inherent decrease in the efficiency.

A very practical question arises in many cases, namely, would it be more economical to merely dust the fixtures instead of taking them down to be restored to perfect cleanliness by a thorough cleaning? In general it will be most economical to do some dusting if the fixtures are easily reached, while if they are mounted in places where access to them is difficult occasional thorough cleanings will be the cheaper.

The greatest saving by cleaning will be realized when the lamps are used most. It is suggested that the lighting fixtures of the average installation be thoroughly cleaned once a month and dusted once between cleanings, which for a great many cases gives about the best practical economy.




FIGS. 7 AND 8—MOST ECONOMICAL INTERVAL BETWEEN CLEANINGS AND SAVING WITH DIFFERENT HOURS OF LAMP USAGE

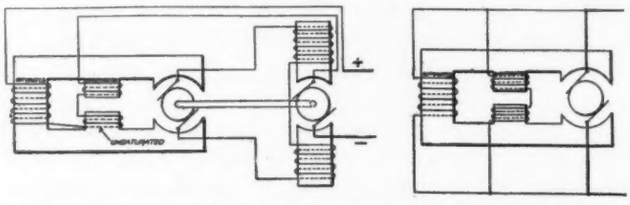
These considerations apply to all places where light is used for illumination. The application for determining the best frequency of cleaning which has been worked out in the preceding paragraphs is, of course, most applicable to the larger installations. The analysis applies to a certain set of particular conditions which exist in one installation, but the method would be identical for any other, and the results are very often strikingly the same.

The process may appear to be rather theoretical for such a practical problem. The factors which are involved in the solution permit of a much more definite determination than is usual in most cost keeping, but it will be found that the maximum point of the curve which gives the saving to be expected is not very definite. Considerable leeway is thus left for engineering judgment. The general form of the curve is the same for all lighting installations; the values which it represents, however, will vary with the design of the fixtures and the general cleanliness of the interior. Very large interiors, like those of factories, offices, halls and the like, can well have such methods applied to them without distrust in the conclusions reached.

## VARIABLE-SPEED GENERATOR

### Machine Equipped with Magnetically Shunted Yoke to Maintain Constant Current or Voltage

A type of variable-speed generator for constant-current or constant-emf. production is suggested in patent No. 1,202,752, issued to Frederick Newton of Luton, Bedfordshire, England. What appears to be the theory of action, which by the way does not coincide with the




GENERATOR CONNECTED FOR SELF AND SEPARATE EXCITATION

theory given in the patent, is as follows: A yoke having a magnetic shunt is arranged with two windings such that the yoke becomes saturated for normal shunt currents, whereas the magnetic shunt, which includes an air gap, has windings on the pole limbs which for normal currents and voltages are magnetically saturated. An increase in the shunt current due to increase of speed cannot increase the yoke flux since the yoke is saturated. On the other hand, with the unsaturated-shunt winding arranged to oppose the yoke excitation, the only path offered to the flux of the correcting winding must pass through the armature in opposition to the flux derived from the shunt winding on the yoke. The voltage of the armature thus remains substantially constant.

Instead of exciting the magnetic system by means of shunt coils connected across the generator terminals, series windings can be used to maintain constant current substantially irrespective of speed. With separate excitation the exciter armature furnishes the field current for the generator, whereas the generator furnishes the field current for the exciter yoke and its shunt.

Though especially adapted for use with variable-speed driving devices, as, for example, trains or wind or water turbines, the machine may be used as an ordinary generator for battery charging or line-booster service, in which cases it may be driven by a prime motor which runs at substantially constant speed. Its characteristics are of value then because it prevents fluctuation of generator output, line pressure or current, with fluctuation in the load which is carried.

# Characteristics of Maximum-Demand Meters

## Performance, Uses and Limitations of the Two Chief Types of These Instruments That Are Now Used Most Extensively by Central Station Companies—Their Separate Fields

BY W. F. KIMBALL

Engineer with Charles H. Tenney & Company

SEPARATE fields of application exist for the two types of maximum-demand meters which are being used most extensively by operating companies, and care should be taken to avoid using either type where the load is unfavorable to the inherent characteristics of the instrument. If this precaution is not taken, accurate results may not be obtained. In this paper the writer purposes to discuss the characteristics, uses and limitations of these two types of instruments—the time-interval, or integrated, demand meter, and the lagged-demand meter.

Since the recording mechanism of integrated, or time-interval, demand meters is reset to zero periodically, the instrument automatically divides the power-load curve into a series of blocks, each covering the same duration of time. Consequently this type of meter does not take cognizance of the load history. It should be obvious, therefore, that some load curves would make such an instrument indicate less than the true maximum demand, the error possible being as great as 50 per cent. For example, consider an instrument whose demand-recording mechanism is set back to zero every thirty minutes. Assume that the power load is zero until fifteen minutes after the demand-recording mechanism begins to operate. Then suppose a constant power load of 1000 hp. comes on and after remaining for thirty consecutive minutes drops instantly to zero and remains so. The true maximum demand for this case is obviously 1000 hp., yet the reading of the instrument would be only 500 hp.; thus the error would be 50 per cent.

Values higher than the true maximum demand can not be recorded by time-interval demand meters, since they register the integrated average load for a given maximum block of power, without giving cognizance to any load conditions either before or after that block of power. When the demand-recording mechanism is in operation it records in direct proportion to the speed of the watt-hour meter, but takes a definite, predetermined time interval to record the full value.

### RESULTS WITH INTERMITTENT LOADS

If used on a "rapid-fire" intermittent load like that composed of flash signs, merry-go-rounds, etc., an instrument of the time-interval type reset every thirty minutes will register the highest average load which occurs between the thirty-minute zero settings. If the load drops to zero several times during the thirty-minute period, the demand-recording mechanism will not drop back to zero to correspond with each drop of the load.

However, the time-interval type of maximum-demand meter will be absolutely correct if used on a constant load or if the period of uninterrupted operation of the demand-recording mechanism is coincident with the greatest average load for the same length of time. Where the load is fairly constant or where the maximum demand is approximately the same day after day, the time-interval type of instruments will give very satisfactory results.

Since the demand-recording mechanism of lagged-demand meters is not reset to zero except when the load drops to zero, these instruments take cognizance of the previous load history. It should be obvious, however, that load curves can exist which will make this type of instrument read less than the true maximum demand, the error in this case also being as great as 50 per cent with certain load conditions.

Again consider a "rapid-fire" intermittent load, like that composed of flash signs, merry-go-rounds, etc. Suppose the load drops to zero every two minutes and that the lagged-demand meter is lagged for thirty minutes. Every time the load drops to zero the demand-recording mechanism is reset to zero. The repeated rising and falling of the demand-recording mechanism under these circumstances is not quite analogous to the movements of the proverbial frog trying to get out of the well, but the net result is that the instrument will read only a very small fraction of the true maximum demand. The instrument error could obviously be considerably greater than 50 per cent under these circumstances.

### LAGGED-DEMAND METERS

The lagged type of demand meter can be made to record considerably higher values than the true maximum demand due to certain loads. This characteristic is due to the instrument taking cognizance of the previous load history. Fortunately the magnitude of errors due to this cause is limited in some cases by the action of the spring against which the torque of the demand-recording mechanism continually acts. It should be remembered that whenever the torque on the demand-recording mechanism just balances this spring there is no further increase in the registration of the lagged-demand meter. Subsequent lighter loads will not show any registration, but subsequent greater loads will cause higher registration than before.

The action mentioned in connection with lagged-demand meters as due to certain load conditions can be such as to produce readings over 20 per cent in excess of the true maximum demand. As an illustration, the action of an instrument is shown in the accompanying diagram, which covers a period of forty-five minutes. The loads for the first thirty minutes represent "load history" on which to base the discussion of the final fifteen minutes. It is assumed that the time lag for the instrument is fifteen minutes. Point *A* represents the actual reading of the instrument at the beginning of the final fifteen minutes. Curves I, II and III represent the actual registration of the instrument during the final fifteen minutes for each of several different load curves for that period. The load conditions and theo-

retical instrument errors are tabulated on the accompanying diagram.

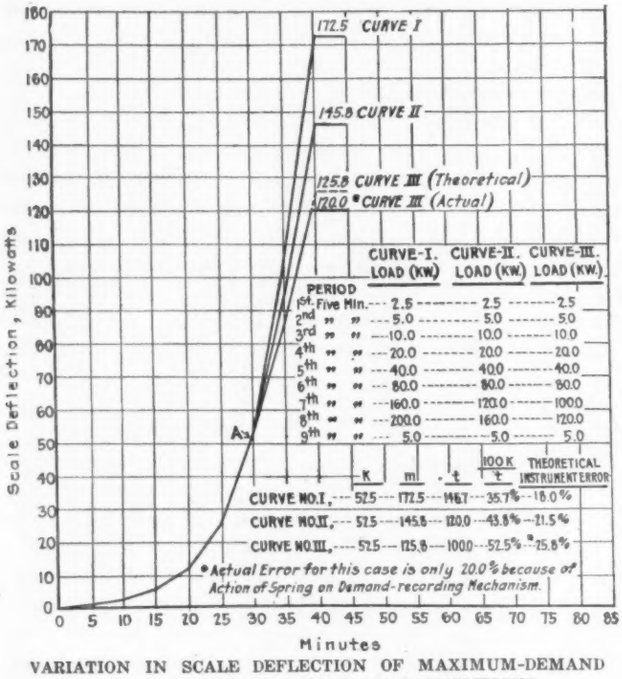
Before discussing the final fifteen-minute period it is interesting to note the error of the instrument at the end of the first thirty minutes. Obviously the true value of maximum demand for the first thirty minutes would be the average load for the second fifteen minutes, *i.e.*, $(20 \times 5 + 40 \times 5 + 80 \times 5) \div 15 = 46.7$ kw. The actual reading of the instrument at the end of the second fifteen minutes is

$$\frac{(2.5 \times 5 + 5.0 \times 5 + 10 \times 5)}{15} + \frac{(20 \times 5 + 40 \times 5 + 80 \times 5)}{15} = 52.5 \text{ kw.}$$

The instrument error (in per cent) at the end of the first thirty minutes is therefore

$$100 \times \frac{(52.5 - 46.7)}{46.7} = 12.4 \text{ per cent.}$$

The relation between the magnitudes of the instrument error, the true maximum demand and the reading


172.5 CURVE I
145.8 CURVE II
125.8 CURVE III (Theoretical)
120.0 * CURVE III (Actual)
CURVE-I. LOAD (KW)
CURVE-II. LOAD (KW)
CURVE-III. LOAD (KW)
PERIOD
1st Five Min. 2.5 2.5 2.5
2nd " " 5.0 5.0 5.0
3rd " " 10.0 10.0 10.0
4th " " 20.0 20.0 20.0
5th " " 40.0 40.0 40.0
6th " " 80.0 80.0 80.0
7th " " 160.0 120.0 100.0
8th " " 200.0 160.0 120.0
9th " " 5.0 5.0 5.0
K m t 100 K/t THEORETICAL INSTRUMENT ERROR
CURVE NO. I, 52.5 172.5 146.7 35.7% 18.0%
CURVE NO. II, 52.5 145.8 120.0 43.8% 21.5%
CURVE NO. III, 52.5 125.8 100.0 52.5% *25.8%
* Actual Error for this case is only 20.0% because of Action of Spring on Demand-recording Mechanism.
Scale Deflection, Kilowatts
Minutes

VARIATION IN SCALE DEFLECTION OF MAXIMUM-DEMAND METERS WITH DIFFERENT LOAD CONDITIONS

of the instrument at the beginning of the period considered can be shown by analytic geometry.

Let $k$ = reading of instrument at beginning of period (due to previous load history).

$m$ = reading of instrument at end of period.

$t$ = reading which instrument ought to show at end of period, *i.e.*, the true value of maximum demand.

Consider the first five minutes out of the final fifteen-minute period. The equation for a straight line passing through two known points is

$$y - y' = \frac{y' - y''}{x' - x''} (x - x') \qquad (1)$$

For the line the instrument ought to follow $x' = 35$; $y' = t$; $x'' = 30$; $y'' = k$.

Substituting in equation (1),

$$y - t = \frac{t - k}{35 - 30} (x - 35) \qquad (2)$$

For the line the instrument actually does follow $x' = 35$; $y' = m$; $x'' = 30$; $y'' = k$.

Substituting in equation (1)

$$y - m = \frac{m - k}{35 - 30} (x - 35) \qquad (3)$$

Adding equations (2) and (3),

$$2y - m - t = \frac{x - 35}{5} (m + t - 2k) \qquad (4)$$

From equation (4)

$$m + t = 2y - \left[\frac{x - 35}{5} (m + t) - 2k \frac{(x - 35)}{5}\right]$$

$$(m + t)\left(1 + \frac{x - 35}{5}\right) = 2y + 2k\left(\frac{x - 35}{5}\right)$$

$$m - t = \frac{5}{x - 30}\left[2y + 2k \frac{(x - 35)}{5}\right] - 2t = \qquad (5)$$

Since the instrument error in per cent $= 100 \frac{(m - t)}{t}$ then from equation (5)

$$100\frac{(m - t)}{t} = \frac{100}{t}\left(\frac{x - 5}{30}\right)\left[2y + 2k \frac{(x - 35)}{5}\right] - 200 \qquad (6)$$

An inspection of equation (6) will show that when $k$ is large and $t$ is small the instrument error is greater than otherwise. In other words, the instrument error will be greatest when a small maximum demand is being measured and when the reading of the instrument at the beginning of the period (owing to previous load history) is a large percentage of the true maximum demand.

It is possible to select values of $k$ and $t$, however, so that even on a rising load curve the instrument will come to a balance before the pointer reaches the theoretical value of $m$. This is due to the spring against which the torque of the demand-recording mechanism acts continually. The spring tension and torque are equal when the reading of the instrument is the same as the acting load. If it were not for this condition, it would be possible to pick out a load curve such that the instrument would read over 25 per cent higher than the true maximum demand. Obviously the true maximum demand for the entire forty-five minutes in this case represented by curve I will be $(80 + 160 + 200) \div 3 = 146.7$ kw. The instrument error for this case is therefore $100 \times \frac{(172.5 - 146.7)}{146.7} = 18$ per cent.

Curve II shows the registration of the instrument during the final fifteen minutes, with a smaller value of $t$ and with $k$ a larger percentage of $t$. In this case the true maximum demand for the entire forty-five minutes will be $(80 + 120 + 160) \div 3 = 120$ kw. The instrument error is therefore $100 \times \frac{(145.8 - 120)}{120} = 21.5$ per cent.

Curve III shows the registration of the instrument during the final fifteen minutes, with a still smaller value of $t$ and $k$ a still larger percentage of $t$. It should be noted that in this case the instrument comes to a balance in the eighth five-minute period before reaching the theoretical value of $m$. Obviously the true maximum demand for the entire forty-five minutes will in this case be $(80 + 100 + 120) \div 3 = 100$ kw. The theoretical error is therefore $100 \times \frac{(125.8 - 100)}{100} = 25.8$ per cent.

The actual error, which is less than the theoretical because of the action of the spring, is

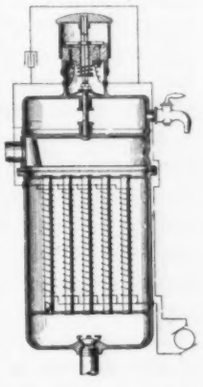
$$100 \times \frac{(120 - 100)}{100} = 20 \text{ per cent.}$$

Any further reduction in the value of $t$ and still further increase in the ratio of $k$ to $t$ will result in a smaller excess reading of the instrument because of the balance of the spring against the torque of the demand-recording mechanism.

The conclusions to be drawn from the foregoing discussion and data presented herewith are as follows: (a) Both types of maximum-demand meter will record accurately on a load which is absolutely constant while the instrument is operating for a period of time equal to the time lag for which the meter is designed. (b) Correct registration of the time-interval type on a fluctuating load will occur only if the period of operation of the demand-recording mechanism is coincident with the period of greatest average load. For any other condition the time-interval type of instrument will read lower than the true maximum demand. (c) The lagged-demand meter is apt to read higher than the true maximum demand on a rising load curve. It is possible that this error may be as high as 20 per cent. (d) The lagged-demand meter will read low if there are frequent big reductions in the load. (e) It is possible with either type of instrument that the reading will be less than the true value of the maximum demand. (f) The lagged-demand meter, when used on certain rising load curves, will penalize the consumer. (g) There is no possibility of penalizing a consumer on account of rising load curves if the time-interval type of instrument is used. Summing up the whole discussion, each of these two types of maximum-demand meter has a field of usefulness, but care must be exercised in order to avoid using either type on a load to which it is not adapted.

## Electric Water Heater

An electric water heater for the instantaneous heating of water has been developed by Emil Stranszky of New York City (patent No. 1,221,106). The heater may be mounted on an ordinary water faucet or attached to a water pipe. The heater is about 7 in. (17.8 cm.) high and 4 in. (10.2 cm.) in diameter. By turning the handle to the left cold water is served and by turning the handle to the right hot water at any temperature is given. In turning the handle two operations are performed, one closing the circuit and the other controlling the flow of the water.



SECTIONAL VIEW OF HEATER

In the heating chamber are several tubes, the ends of which are attached to head plates, each tube being covered with insulation. A coil of resistance wire is wound over the insulation of each tube. The coils are connected in parallel or series parallel, depending on the position of the water-controlling handle. A condenser is provided to prevent sparking at the switch. These heaters can also be made in large sizes.

## LOWERING THE COST OF HANDLING ACCOUNTS

### Simple and Economical System of Balancing Cash Receipts Daily in Use by Baltimore Central Station Company

The Consolidated Gas, Electric Light & Power Company of Baltimore has in operation a system of balancing cash receipts daily which is very simple and economical. Following is a résumé of the system employed: The service bill is rendered with payment stub attached, the stub being automatically detached by the tellers at the time of receipting the bill.

At hourly intervals payment stubs are taken from the tellers before any record has been made on them and assorted into section order. After being assorted these stubs are listed on adding machines, totals being made in section units, this listing being stamped with the date of the cash and the teller's number, together with the names of the clerks assorting, adding and verifying. The stubs are turned over to the comptometer operator, who verifies the machine listing, and are then listed on a summary which is maintained to record for each teller the daily receipts from sections. This summary is posted each day from listings prepared as outlined above and when added should represent the total amount of cash received each day from each teller. Totals of all tellers' summaries are listed on an adding machine by sections, the purpose being to determine the amount of money received.

The cash payment stubs are employed in crediting the customer's account and must therefore be further accounted for before they are in condition for posting.

After listing the teller unit is dispensed with and the stubs are assorted in racks which accommodate as many ledger units as are in use, namely, 200. At the end of the day after all the stubs from every teller have been assorted or racked in the ledger units, each unit is assorted into folio order and clamped together in lots of about twenty-five to prevent loss in handling and facilitate posting to the customers' accounts. After posting to the ledgers has been completed the stubs are added, totals being obtained for each ledger unit.

In performing this work eleven junior clerks are employed at a monthly labor cost of $434.50, making the average cost per stub 0.3 cent. About 13,636 stubs are handled per man during each month.

The unpaid balance at the end of the calendar month is obtained by securing a record of the cash payments posted to each ledger in the preceding calendar month between the first and the reading day of each ledger. Obviously this figure is practically the unpaid balance at the end of the previous calendar month, as the billing is entered upon the ledger once a month only and within the previous calendar month. By this method the major portion of the unpaid balance is secured automatically and it is only necessary to survey the ledger for bills remaining unpaid for one month or more. Thus the ledgers are balanced on a calendar-month basis as no attempt is made to balance each ledger until the reading date in the subsequent month has been reached. In this work seven clerks are hired at a monthly labor expense of $376.50, the average cost per account being 0.25 cent. About 21,428 accounts are balanced per month per clerk with this system, making it possible to operate with 50 per cent fewer clerks.

# Can Central Stations Offer Lower Power Rates?

## Electricity Marketed at Low Cost for Power Purposes in Western States Now Affords Communities Unprecedented Opportunity to Attract Industries

BY F. EMERSON HOAR
Gas and Electrical Engineer, Railroad Commission of the State of California

ECONOMIC conditions which have prevailed for the last two years have brought about important changes in the conditions of the power market. The Western states, where large manufacturing establishments are comparatively few and where the power possibilities are large, have come face to face with an opportunity which is without parallel.

The present unprecedented industrial situation is greatly hastening the time when the hydroelectric power possibilities of the Western states will be utilized either by the new industries seeking low-cost power or by the established power interests which will furnish low-cost power.

If the former condition obtains, the power companies will not only lose an important market which is both directly and indirectly profitable, but in all probability will be forced to compete with large blocks of surplus power produced by industrial establishments. As proof of this statement it is only necessary to call attention to the fact that the market invariably absorbs surplus hydroelectric energy.

Industries in which power is a large factor will sooner or later establish factories in regions where hydraulic power can be developed at low cost.

Raw materials are readily available in the Pacific Coast States for many of these new industries, transportation both by rail and water is at hand, and ample power and satisfactory rates can be obtained.

There are three general classes of industries which are being developed as a result of present economic conditions. Each class has certain characteristics which it is necessary to analyze in order to determine the desirability of the business from a power point of view.

The first class may be assumed to include those industries which are devoted to the production of the immediate instrumentalities of war. This class of business is largely of the mushroom variety and can well afford to pay the regularly established power rates. As a possible temporary market for surplus power this class may be of interest to the operators of hydroelectric properties, although caution must be exercised in making large capital expenditures to provide service facilities.

The second class embraces those industries established or enlarged to replace the wastage of war. The characteristic feature of industries of this class is a development beyond the needs of the normally available market. Unlike the class first mentioned, this class of business may continue to operate at full capacity for a considerable period after normal conditions are restored, with the possibility that an increased market will insure permanency. Usually the needs of industries of this class can be met with the ordinary industrial power rates, although special conditions will be presented requiring careful consideration.

The third class may be generally described as those industries newly established or enlarged to supply the normal demand for a product or commodity which has heretofore been obtained largely or wholly from foreign producers.

It is this latter class of business which offers the greatest opportunity for the successful marketing of large blocks of electric power. The reason why this opportunity exists is simply that foreign competition is temporarily eliminated, providing a ready market at prices largely in excess of normal.

Such a combination of favorable circumstances permits the establishment of new industries with the practical assurance that the usual starvation period can be avoided.

### KILOWATT-HOUR BASIS MISLEADING

The chief obstacle to progress toward a rate which will attract large industries of the class referred to is not the cost of service but the attitude of the power companies. The evolution of the lighting company into the power company has been so rapid that the present-day opportunities for power development find the central station management still thinking and talking in kilowatt-hours. Power rates are almost invariably studied on the hour basis, and the relative desirability of two or more classes of business is usually judged by comparing the price per kilowatt-hour. The result of such a comparison is always misleading and conveys no idea as to the profitableness of any particular business. For example, a rate of 10 cents per kilowatt-hour under certain conditions may be and often is less profitable than a rate of 1 cent or less per kilowatt-hour under other conditions.

An illustration of this is a recent instance of intensive solicitation on the part of a large California company for a certain class of power business at a rate of approximately 3 cents per kilowatt-hour. This business, when secured, was in reality less profitable and less dependable than other business which the company had first objected to taking in large blocks at a rate of $25 per horsepower-year.

Annual revenue per unit of demand, not the kilowatt-hour rate, should be the basis of comparing the relative desirability of prospective power business, and even this comparison can become practically valueless if considered independent of the operating conditions of the supplying company and the characteristics of the prospective load.

There has been a tendency on the part of Pacific Coast power companies to regard 0.75 cent per kilowatt-hour as about the minimum profitable rate that should be considered, yet from 20 to 60 per cent of the business of several of the largest of the California companies is supplied at considerably lower rates. Four of these companies are regularly furnishing upward of 50,000 kw. at rates which average approximately 56 mills per kilowatt-hour. Similarly, the wholesale rate of $35 per

horsepower-year is occasionally suggested as the dividing line between profitable and unprofitable business.

Notwithstanding the difference in opinion which exists relative to minimum profitable rates, the base load of a large percentage of operating companies in California is made up of relatively large blocks of power yielding an annual revenue of from $12 to $30 per horsepower. Such base loads constitute the backbone of the income of these companies and have made possible the development of hydroelectric projects on a scale which without such business it would have been difficult to justify.

There is immediately available in California at this time from 15,000 kw. to 20,000 kw. in developed hydroelectric power which could be profitably sold for continuous service at rates varying from $15 to $25 per horsepower per year. In addition to this continuous supply large blocks of limited-period power are available, either for continuous delivery during eight to twenty hours per day throughout the year or for twenty-four-hour delivery during six to ten months of the year. The limited-period service could be supplied at low rates to the advantage of both the power companies and certain classes of industrial users.

### Additional Power Sources

The early development of additional large power projects on the North Fork of the Feather River and on Big Creek, in California, is dependent largely upon the possibility of securing suitable base industrial loads. Of the 300,000 kw. or more which these new projects are capable of producing, the necessary base load ratio may be assumed to be from one-quarter to one-third of the total generating capacity to be installed.

It has been conservatively estimated that 70,000 kw. to be developed at a site on the Pitt River in California could be delivered 250 miles (402 km.) from the source over duplicate transmission lines to tidewater at a total cost of $130 per kilowatt. This estimate was based on copper at 16 cents. However, the minimum flow of Pitt River over a period of years would permit a development of 105,000 kw. in one plant capable of operating, so far as water is concerned, at 100 per cent annual load factor. This site is about 25 miles (40 km.) from railroad transportation and with a required total capital investment well within $35 per horsepower of generating capacity power could be delivered to railway points at a cost which would permit the dream of $7 to $10 power to be realized.

Disregarding the possibility of steam plant installation in the California oil fields, where both oil and natural gas are available at relatively low prices, only the hydroelectric possibilities are to be considered in reckoning with low-cost power for large industries. In fact, those companies which are now operating with large steam reserves are at a considerable disadvantage because of large production and overhead charges which must be saddled on new developments added to such a system.

For example, from 60 to 100 per cent of the hydroelectric power is about an average amount of steam reserve capacity to be installed by a California company doing an average light and power business. In the vicinity of San Francisco the steam reserve is about 60 per cent of the available hydroelectric capacity, and the ratio of steam to hydraulic capacity varies from no steam reserve in the northern portion of the State to no hydroelectric energy in the extreme southern portion.

Considerable advantage has already been obtained in California by tying together the transmission system of several of the larger companies. However, it is believed that the time is not far distant when all of the important power systems will be interconnected by means of a bus line traversing the central portion of the State in a northerly and southerly direction. Such a plan is believed to be entirely practicable so far as physical conditions are concerned, and by combining the diversities of demand and reducing losses it should permit the conservation of not less than 20,000 kw. in generating capacity. The pooling of production facilities, both steam and hydraulic, would in all probability make it unnecessary to increase further the steam reserve.

The present is a period of transition—a change from old to new industrial conditions such as will probably never occur again. The West urgently needs new industries, and it can attract them most easily by offering favorable terms for electric power. A careful analysis of every prospect for new industrial business would be well worth while, and in considering the desirability of undertaking to supply service to such industries it is essential that the power companies clearly recognize the necessities and limitations of the prospective business.

It would be well to have these investigations made by men not prejudiced in favor of the old kilowatt-hour method of comparison, and it should be borne in mind, in attempting to arrive at an equitable rate, that the present abnormal market conditions will cease to exist after the re-establishment of foreign commerce, and that the price which a new industry can afford to pay for power will be governed largely by conditions over which it has no control. Undoubtedly lower power rates for large industries are coming, and those power companies which first realize this new condition and endeavor to meet the situation will profit most thereby.

This article was written before the United States declared war against Germany and is not intended to refer to economic or military necessities brought about by conditions which have since developed.

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## TRUCK-DRAWN POLE TRAILERS

### Cost of Using Trucks to Haul Poles Found to Be About One-Fourth That of Using Horses

In comparing the expenses of using horse and auto trucks to transport poles the Springfield district of the New England Telephone & Telegraph Company recently found that the truck-drawn trailer will do the same work as a horse-drawn trailer in about one-sixth of the time. During 115 hours of pole hauling in twelve days the truck traveled 441 miles (709.7 km.) at a cost of little more than 25 cents per mile (17.7 cents per km.). Using horses for the same work would have required seventy-one days at a rate of 97 cents per mile (69 cents per km.). An additional point in favor of such trucks is the fact that the hired teams are slow in delivering poles, causing a great deal of lost time and often necessitating an additional light team to transport the men and tools. When using a truck and trailer, the men, poles and tools will arrive on the job at the same time, so the work can proceed without delay.

# STATION AND OPERATING PRACTICE

*A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy*

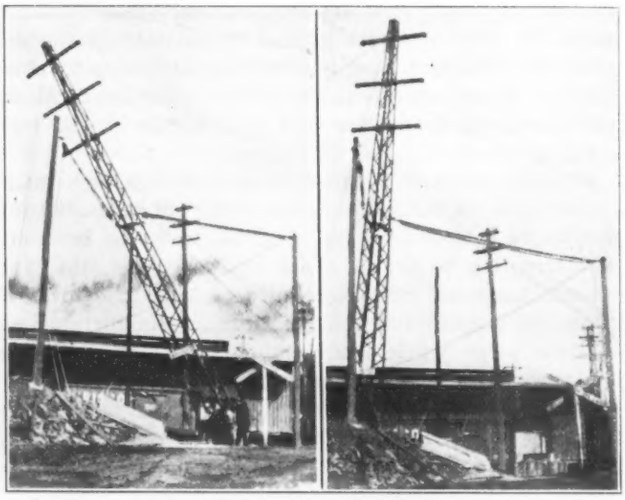
## MOVING HEAVY TOWER

### How Two Gin Poles Were Used to Transport a Transmission-Line Tower 30 Ft.

BY E. B. HOOK, JR.

Superintendent of Construction, Georgia Railway & Power Company

On account of changing the direction of a street in Rome, Ga., the 75-ft. (22.9-m.), 4-ton (3.6-metric ton) steel tower shown in the accompanying illustration had to be moved 30 ft. (9.1 m.) to bring it to one side of the roadway. This operation was performed by means



STEPS IN PROCESS OF MOVING TOWER

of two 40-ft. (12.2-m.) gin poles, thirty minutes being required to move the tower and bolt it to the new concrete foundation. Snow and sleet were falling during transportation. The insulators were removed from the tower and the 66,000-volt lines temporarily supported on wood poles. Blocks and tackle were fastened to the tower and the gin poles, which were erected and guyed at each end of the line along which the tower had to be moved. After the tower had been tilted in the direction it was to be moved the tackle on the pole toward which it leaned was hauled in, thus dragging the base of the tower into its new position. The other gin pole and tackle prevented the tower toppling over entirely.

## OVERHEATING OF TRANSFORMERS

### Causes of Overload and Need of Checking Meters to Make Certain They Show True Load

BY E. C. PARHAM

Owing to the fact that transformers have no moving parts, their field of trouble is generally limited to overload, lightning or mechanical abuse in handling. Overload may be due to high voltage, low frequency, or both. It may be due also to giving the transformer too much work to do or to trying to operate in polyphase or parallel connections transformers that are not adapted to such operation. Operators are apt gradually to overload a bank without being aware that they are doing so, the only certain check for such a condition being suitable instruments for showing what the transformers are doing. Proper connection of the instruments is as essential as their proper design.

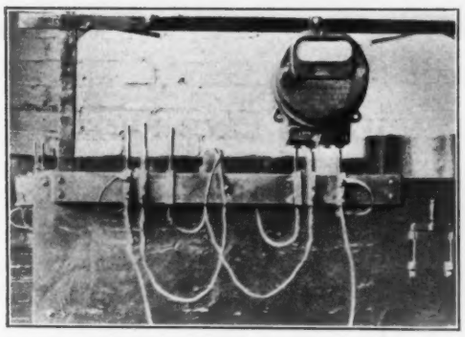
In one case an operator complained that two of three delta-connected oil-cooled units that had been in successful operation for years were overheating, and he stated that he was sure that the heating was not due to connected overload. The transformer elements were removed from the oil and carefully inspected. All coils were found to be correctly placed, correctly connected, of the correct rating and in good condition. They were replaced and the transformers again placed into service. Their output had always been measured through a polyphase watt-hour meter, but apparently it had not occurred to anyone that the indications of the meter were out of proportion to the load the transformers were carrying. A three-hour test disclosed the fact that as far as the indications of the meter were concerned transformers of one-fifth the size used could have safely carried the load, but on checking the connections of the meter the meter elements were found to be opposing each other. Readings taken after the connections had been corrected revealed overload conditions that at times were excessive.

## TEST BAR FOR THE QUICK CONNECTION OF METERS

### Bronze Pins Clamped to Test Bars Permit This Operation to Be Performed with Saving of Time and Labor

A labor-saving test bar for checking meters is in use in the meter shop of the Cumberland County Power & Light Company, Portland, Me. As shown, it consists of a pair of 2-in. (5.08 cm.) by 5/8-in. (15.9 mm.) wooden strips which rest against the upper edge of an asbestos-sheet test panel. The bar at the front carries two sets of three clamps each separated by fiber blocks to prevent short-circuiting by the fingers when in use. From each clamp a bronze pin 3 in. (7.62 cm.) long projects upward, forming a plug which fits into the terminal bushing of the meter when the latter is hung in position above the test bar as shown. On the middle pin are wooden thimbles which protect the fingers from the live parts. Each pin is fitted with a spiral spring which forces it into the meter terminal and insures a good contact when in service. The meters under test are hung from a 1-in. (2.54-cm.) by 1/8-in. (3.2-mm.) angle-iron bar carried on standards of the same size 11 in. (27.9 cm.) above the test bar. The upper bar can be lowered in an instant into one of several notches by manipulating the locking levers shown. From the clamps leads ex-

tend to a Mowbray test meter on a shelf at the bottom of the test panel and to the source of energy supply. The test bar is 23 in. (58.4 cm.) long and has been treated with black varnish. The test board contains load-varying switches, a reversing switch for the checking meter, switches for cutting potential coils in or out, and for supplying energy at 100 per cent and 50 per cent power factor. The test bar was designed from materials readily available at the shop by H. J. Howarth, superintendent of the meter department. It saves at least two minutes per meter test, no adjustment of connections being required when the clamps are properly spaced to fit the particular size and type of meter under test. The clamp spacing and the height of the test bar can be determined by a moment's handling to suit any meter within the range of the test equipment.



METER RACK WITH AN INSTRUMENT IN PLACE

## VALUE OF TREATING POLES AND EQUIPMENT

### Why It Pays to Buy Twenty Years of Life in Pole-Line Equipment, and Other Considerations That Reduce Cost of Service

In a paper read before the Minnesota Electrical Association, S. B. Hood of the Minneapolis General Electric Company made an appeal for permanency in line construction. It has been shown, he said, that the average life of a pole which has had a good open-tank treatment with a high-distillate creosote oil will be twenty years, as compared with eight to ten years for untreated poles. As an example of the economy of pole treatment, he continued, take a 35-ft. pole costing when it is set in position untreated $10 and having a life of eight years. Compare this with a treated pole costing in position about $11.50 and having at least twenty years of useful life. With interest at 6 per cent, the annual cost for the untreated pole is $1.85 and for the treated pole $1.26, a decrease of nearly one-third in the annual fixed charges.

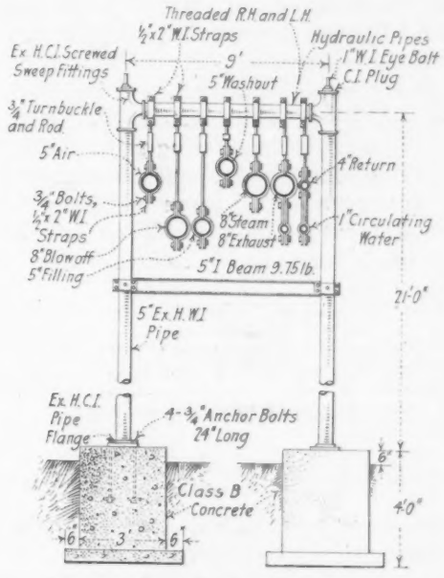
If the life of the poles is increased, it is necessary to get an equal life from the various pole fittings. In the case of hardware this has been accomplished by using a zinc coating, the hot galvanizing process having been proved the best. For cross-arms an equal life can be obtained by open-tank impregnation similar to that used for the pole butts. The life of the arm as well as its strength can also be increased considerably by using one of the several forms of metal pin which clamp around the arm. Where the cost of these is not warranted metal pins with a small shank may be used. The old-style wood pin, requiring the removal of a large part of the arm to provide a sufficiently large hole, should have no place in modern overhead construction, Mr. Hood pointed out.

For low-tension circuits, principally secondary work, where the maximum voltage does not exceed 750 volts between wires, cross-arm construction should be abandoned entirely for galvanized-steel racks or brackets. These cost less than good cross-arms with their fittings, and there is practically no limit to the useful life that can be had from them. In addition, they make it possible to support the wires in a vertical plane on short centers. In this position there is no tendency for the wires to swing together, and if the circuit carries alternating current the inductive drop is materially reduced by the close spacing. This method of construction permits taking off service drops without using an unsightly buck-arm. The general appearance of a line constructed with these brackets or racks is all that can be desired and should reduce the growing demand for underground construction in congested districts.

## OVERHEAD PIPE SUPPORTS

### Rack for Pipes in Places Where They Cannot Be Suspended from Some Overhead Structure

To support the steam mains which run overhead between its boiler and engine house one Eastern company employs the method illustrated herewith. Extra-strong wrought-iron pipe with extra-heavy screwed sweep fittings is used, supports being placed at 20-ft. (6.1-m.) intervals. The uprights, which are filled with concrete, are braced by means of a 5-in. (12.7-cm.) I-beam and are anchored to concrete bases by means of bolts and anchor plates. Plug fittings screwed into the top of each upright hold in place a 1-in. (2.54-cm.) wrought-iron eye bolt to which are connected the wrought-iron rods for longitudinal bracing, the latter being tightened as required by adjusting the turnbuckles.




DETAILS OF RACK SUPPORTING PIPES

Pipes are supported from the horizontal pipe at the top by means of a turnbuckle on each hanger. Repairs are facilitated through the use of bolted wrought-iron

pipe straps connected to separate hangers. In order to drain the pipes some are inclined toward the boiler room while others are pitched to the engine house.

Openings for the entrance of pipes are left in each building wall. Plates protect these openings, each opening having three plates divided so as to be readily removable when required without disturbing any pipes other than the one to be taken down. Angles with bolt and anchor plates are used to secure the plates.

The pipes are carried overhead, since this arrangement permits the most direct run and one which does not necessitate the dripping of pockets that would otherwise be formed. Elaborate protection of underground pipes by means of a concrete tunnel or boxing which deteriorates along with the pipe covering is also avoided. Being exposed to the weather, the overhead pipes are well covered with canvas and a weatherproof protection of lead-coated sheet metal.

## OIL ENGINES VERSUS TRANSMISSION-LINE SERVICE

### Data That Indicate That a Line 20 Miles Long Can Compete Successfully with Service from an Isolated Plant

While fuel oil for operating an internal-combustion engine may cost more than coal for operating a steam plant, oil engines are usually popular in towns of about 900 population, Earl D. Jackson, a consulting engineer of St. Paul, Minn., declares. For effective day service, including connections to motors and ranges, however, Mr. Jackson does not consider that the combination oil engine and storage battery plant compares economically with transmission line service. As a basis for his views the following analysis is presented, it being assumed that an oil-engine plant containing one 50-kw. and one 15-kw. semi-Diesel unit is giving twenty hours of service and requiring the partial services of two men. The cost of a complete generating plant of this type, including the building, would amount to approximately $14,000. If the business is properly developed the plant should generate yearly about 75,000 kw.-hr. The generating cost per kilowatt-hour would then be as follows:

| | |
|---|---|
| Fuel oil at 0.024 cent per kilowatt-hour | $1,800.00 |
| Lubricating oil, incidentals, etc | 500.00 |
| Labor, two-thirds of superintendent's time, one-third being charged to distribution in town | 600.00 |
| Assistant operator | 720.00 |
| Interest at 6 per cent and depreciation at 7 per cent | 1,820.00 |
| Total | $5,440.00 |
| Cost per kilowatt-hour ($5,440 ÷ 75,000) | 0.073 |

To show how much transmission line could be built without having the cost of energy to the city exceed the cost from a separate generating plant, the following data were used. It was assumed that energy could be purchased for 3 cents per kilowatt-hour at the generating source, and that the core loss and line loss per year would be approximately 10,000 kw.-hr. This loss added to the original output (75,000 kw.-hr.) assumed for the oil-engine plant equals 85,000 kw.-hr. which would be purchased at 3 cents, making the total energy cost $2,550. The cost of transmission line repairs and inspection was placed at $600, making the total yearly cost $3,150. The difference between $5,440, the yearly expense of the generating plant, and $3,150, the transmission-line expense, gives $2,290, or the amount which would be applicable to interest and depreciation on the transmission line. If the fixed charges are taken at 13 per cent, it will be seen that $17,600 will be applicable for building the transmission line, which will build an inexpensively constructed transmission line 20 miles (32.2 km.) long with an outdoor-type substation.

## DISTRIBUTION-LINE PROTECTION

### Practice That Is Followed by Southern California Company in Safeguarding Its Circuits

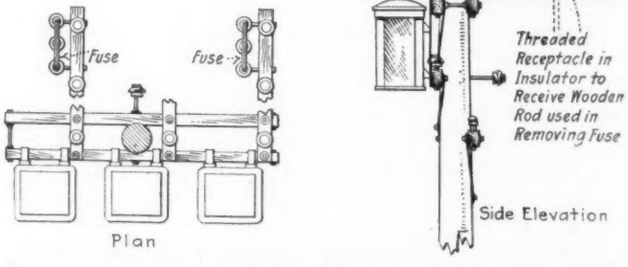
On the 2300-volt distribution system of the San Joaquin Light & Power Corporation, Fresno, Cal., all circuits are protected by automatic oil circuit breakers at the substations, pole-top oil switches being used for sectionalizing the line. All transformers are protected by General Electric plug cut-outs, the following table being used for fusing the 2300-volt transformers:

| Kva. | Fuse Rating (amp.) | Kva. | Fuse Rating (amp.) | Kva. | Fuse Rating (amp.) |
|---|---|---|---|---|---|
| 1 | 1 | 7.5 | 5 | 30 | 20 |
| 2 | 1 | 10 | 6 | 37.5 | 25 |
| 3 | 2 | 15 | 10 | 40 | 30 |
| 4 | 2 | 20 | 15 | 50 | 30 |
| 5 | 3 | 25 | 15 | | |

Various makes of three-pole fuses, or a combination switch and fuse, have been considered, but the expense involved is so great compared with that of the 6600-volt disconnects now in use that it has been decided to continue the use of the switches named.

The 10,000-volt feeders from substations of this company are protected by three-pole General Electric K-12 automatic oil circuit breakers. All branch lines are connected with the main feeder through three-pole single-disk K.P.F. pole-top air-break switches. Similar-type switches are installed about every two or three miles apart to sectionalize the lines. Since almost all of the circuits are of the "loop" type, a short section of line can be cut out in case of trouble without serious interruption to the whole line. Taps leading to transformers are protected by "disconnects" made at the company shop. The construction of these switches is shown herewith. Attached to each cross-bar holding a fuse is a standard 10-kv. insulator. By screwing a threaded 5-ft. (1.5-m.) stick into this insulator the cross-bar may be removed from the clips for refusing or disconnecting. Approximately 15,000 of these "disconnects" are in service on this system, and very little trouble has been experienced from them. The cost of three of these "disconnects" f.o.b. storeroom is $5.78.

POSITION OF FUSES DESIGNED TO BE REMOVED WITH INSULATED ROD



# CENTRAL STATION SERVICE

*A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat*

## DATA ON COST OF MINING COAL BY ELECTRICITY

### Illinois Mine with a Daily Output of 5000 Tons Has Energy Consumption of 2.15 Kw.-Hr. per Ton Mined

From one typical totally electrified Illinois mine the output of which is 5000 tons of coal per day the energy used per ton mined was 2.15 kw.-hr., it was stated by Orlie Rue of Mattoon, Ill., before the recent meeting of the commercial men of the Illinois State Electrical Association. The coal is raised from a depth of 349 ft., the total hoisting distance being 400 ft. The thickness of the vein of coal is 8 ft. The equipment is:

Hoist—675-hp., 550-volt, 980-amp., 65-r.p.m. conical two-drum direct-current motor.
Auxiliary Motors—100-hp., 440-volt, 60-cycle, three-phase, 490-r.p.m. slip-ring; 3-hp., 440-volt alternating-current for air compressor.
Flywheel Set—Generator (direct-connected), 550 volt, 1000 amp.
Motor—450-hp., 2300-volt, 102-amp, three-phase, 60-cycle, alternating-current, 695-r.p.m.; 240-volt, 833-amp. exciter; flywheel, 9-ton, 9-ft. diameter.
Fan—75-hp., 440-volt, 60-cycle, three-phase, alternating-current; speeds, 300, 450, 600 r.p.m.
Shaker Screen—50-hp. direct-current motor.
Picking Tables—Three 5-hp. direct-current motors; shop, 10-hp. alternating-current motor.
Motor Generator Sets—Two sets (duplicates); generator—250-volt, 1090-amp., 600-r.p.m., 300-kw. Motor—2300-volt, 87-amp., 600-r.p.m., 420-hp. alternating-current. Exciter—120-volt, 91.5-amp.
Underground—10-hp. direct-current motor-driven pump; eight 5-ton locomotives; two 12-ton locomotives; twenty breast-cutting machines.

The total alternating-current connected load at this mine amounts to 1479 hp. The energy for the operation is furnished by the Central Illinois Public Service Company. The following data were taken over a period of twelve months from March, 1915, to March, 1916:

| | |
|---|---|
| Days worked | 275.5 |
| Tons produced | 834,011.35 |
| Average tons per eight-hour day | 3,020.00 |
| Total kilowatt-hours used per year | 1,793,106.00 |
| Kilowatt-hours per ton hoist, alternating current | 0.62 |
| Kilowatt-hours per ton, 2300-volt alternating current, including the hauling, cutting shaker screen and picking-table motors | 1.10 |
| Kilowatt-hours per ton, 440-volt alternating current, for such service as the ventilating fan, the air compressor and the workshop motors | 0.43 |
| Kilowatt-hours per ton mined | 2.15 |

## ADVERTISING ADVANTAGES OF ELECTRIC SERVICE

### Public Told the Story of Increasing Costs and of Difference Between Selling Service and Selling Energy in Series of Nine Advertisements

There has recently been completed by the Duluth Edison Electric Company of Duluth, Minn., the publication of a series of nine service talks which were aimed to accomplish two purposes—one to impress upon the general public the trend of the cost of electric service with respect to that of other commodities entering into the cost of living and the other to show the central station customer what constitutes the difference between selling electricity and selling electric service. The first advertisement of the series was published on March 6 and the ninth and last of the series was published on April 1. This last advertisement so accurately sums up all that has been said in the foregoing series that the text is herewith repeated.

The first number of the series was a full-page advertisement containing a chart to show the trend of wages and city taxes and of the cost of such common commodities as meat, coal, cotton, wheat and electric lighting. It occupied a full page and announced the fact that a series of talks on the company's business would be published in succeeding issues of the paper. The topics treated in the succeeding issues were: Service interruptions, the commercial service department, connecting up the customer, lamp conveniences, courtesy, testing customers' lamps, and civic pride. Each of these subjects was published with a distinctive border in a 4.5-in. by 10-in. (11.43-cm. by 25.4-cm.) space. Each was a straightforward, clear-cut statement of the company's policy and its facilities for providing service, together with an appeal to the customer to use that service.

SERVICE FIRST

ELECTRICAL SERVICE

(*Article No. 9 on Electric Service in Duluth.*)

Our business is *not* making and selling *electricity*. You may be a little startled at this statement, but it is true, very true. Instead, our business is to sell Electrical Service. There is a big difference between selling Electricity and Electrical Service.

Suppose you wanted to buy some electricity. We would run some wires to your house, any kind of wires, connect you on, and then go away and only look your direction when it came to sending you a bill. That would be selling electricity. But that is *not* our business.

Now suppose you wanted to buy some Electrical Service. We check up the amount you want and see that our lines to your house are made of copper wire of rigid specifications and ample size to give you proper pressure. A meter is carefully checked to see that it is correct before placing it in your house. We make every effort to get the current turned on in as short a time as possible so that you will not be inconvenienced for lack of service. We create convenient places to purchase your lamps, or deliver them to your door. We have the lamps carefully inspected by experts to protect you from defective lamps. We maintain a trouble department to help you should an interruption to service occur. We study your problems so as to give you the most economical use of the electricity. We try to answer all of your questions courteously. If something wrong has developed we send men to locate your troubles. We periodically test and inspect the lines to your house so as to take care of your added requirements so when they are attached the service will not be found lacking and inconvenience you. We have experts to give you honest advice on how to use electricity economically to accomplish a certain task.

This is selling Electrical Service, and is our business.

In the preceding articles we have described our services and told you how to use them. They were created for you. Take advantage of them.

DULUTH-EDISON ELECTRIC COMPANY

216 WEST FIRST STREET

Melrose 911—Telephones—Grand 295.

The results of this advertising which the executives of the company have noticed thus far are interesting. They have found that people are beginning to talk

about electric service and that the idea of service is firmly fixed in their minds rather than simply the idea of electric lighting. This has been made clear in several instances where customers in talking to salesmen have of their own accord mentioned general electric service. Furthermore, it is definitely known that the feeling of the people toward the company is a sympathetic one. They are beginning to realize that its costs have increased enormously while the price of its commodity has remained the same.

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## ANALYSIS OF COSTS TO OPERATE ISOLATED PLANTS

### Report of Sub-Committee of the Power Sales Bureau of the N. E. L. A. Gives Results of a Wide Investigation

In its first report the isolated plant division of the Power Sales Bureau of the N. E. L. A., I. Lundgaard, chairman, presents the results of a wide investigation of isolated-plant costs with comparative data on central station service. The report also includes a study of supply of auxiliary power to owners of water power. Under various headings will be found data on internal-combustion engine plants, recent information obtained on modern small-size steam engines and turbines, and information in regard to power plant construction costs. The committee also submits in this report a study of methods of computing steam required for the heating of buildings, with an analysis of the value of exhaust steam that is obtained from isolated plants for heating service.

In presenting its analysis of costs the committee points out that competitive sale of electrical energy is a matter of comparative cost of one source against another, not necessarily of comparative cost of power alone, but of cost as applied to the purposes of the buyer's business. An unreliable source of power, while inexpensive in itself, will obviously prove to be very expensive for ordinary manufacturing purposes wherever the production of a large number of employees depends entirely or in large measure upon the operation of machinery by power.

"While comparative power cost analysis is affected by such items as reliability and other matters of more or less intangible character, it is, however, the principal argument upon which the sale must be accomplished. The average power customer possesses an entirely inadequate knowledge of power cost analysis and is sometimes ill informed on matters of industrial economics, so that it is often necessary to undertake much education of the prospective power customer before the sale can be made.

"It is both unwise and impracticable to adopt the standard method of selling, namely, to tell the 'prospect' all about your wares and to say nothing about those of the competitor, because the competitor in this particular field invariably fails to tell all about his wares, and what he leaves out does not help to sell central station service.

"The power salesman must be able to undertake a complete engineering investigation of the 'prospect's' power requirements and submit to him a report showing the merits or demerits of all proposed methods of furnishing power. The preparation of such a report is undoubtedly the most important part of a power salesman's work."

### COMPARATIVE COSTS OF OPERATING WITH ISOLATED PLANT AND BY MEANS OF PURCHASED POWER

| Character of Business | Kind of Isolated Plant Considered (Steam)* | Electrical Equipment: No. of Units | Electrical Equipment: Total Capacity in Kw. | Mechanical Power Equipment: No. of Units | Mechanical Power Equipment: Total Capacity in Kw. | Other Uses for Steam‡ | Boilers: No. of Units | Boilers: Total Hp. | No. of Men in Plant | Hours per Day Operation | Annual Labor Cost | Supplies and Repairs | For Power, Other Uses, Tons of Coal per Year | Cost of Coal | Ash and Coal Handling | Cost of Water | Cost of Floor Space | Purchased Electricity | Superintendence | Total Plant Investment | Per Cent of Fixed Charge | Annual Fixed Charge | Boiler and Compensation Insurance | Total Annual Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COST OF ISOLATED-PLANT OPERATION** | | | | | | | | | | | | | | | | | | | | | | | | |
| Fertilizer | E | 2 | 225 | 1 | 225 | | 2 | 700 | 7 | | $6,396 | $800 | 4,800 | $15,360 | | | | | | | | | | $24,056 |
| Fertilizer | E | 1 | 35 | | 187 | | 2 | 300 | 2 | | 1,820 | 200 | 1,000 | 3,200 | | | | | | | | | | |
| Office and manufacturing building | E | 2 | 150 | | | A | | | | 17 | 3,900 | 282 | 809-216 | 3,753 | $104 | $41 | | | | | | | | 7,872 |
| Office building | E | 2 | 150 | | | B | 2 | 300 | 6 | 24 | 4,130 | 400 | 1,200 | 3,840 | 60 | 130 | | $230 | | | | | | 7,686 |
| Hotel | P | 3 | 325 | | | C | 3 | 525 | 9 | 24 | 8,684 | 2750 | 4,200 | 15,540 | 480 | 600 | | | | $57,600 | 13 | $7,527 | | 35,581 | 30,564 |
| Chemical | E | | | | | | | | 7 | | 7,080 | 2340 | 6,696 | 14,664 | | 1164 | | | | 30,000 | 15 | 4,560 | | 29,808 | 23,440 |
| Grain elevator | P | | | | | | | | 14 | | 12,990 | 6500 | | 22,400 | 1200 | | | | | 300,000 | 11.5 | 34,500 | | 77,590 | 68,980 |
| Hotel† | E | 3 | 925 | | | D | | | 16 | 24 | 3,360 | 900 | | 25,326 | 720 | 1310 | | | | | | | | 31,616 | 31,515 |
| Apartment | E | 3 | 217.5 | | | E | 3 | 600 | 6 | 24 | 5,520 | 1650 | 2,900 | 11,165 | 465 | 342 | | | | | | | $170 | 19,142 | 18,378 |
| Manufacturing building | E | 3 | 300 | 2 | | | 5 | 1000 | 11 | | 10,192 | 1200 | 7,500 | 29,250 | 480 | 2552 | | | | | | | 163 | 43,844 | 35,778 |
| Manufacturing plant | P | 1 | 500 | | | A | | | 24 | | 8,190 | 3337 | 10,870 | 27,700 | | 4125 | | | $1000 | 46,385 | 13 | 6,030 | | 50,548 | 49,394 |
| Shoe factory | E | 3 | 250 | | | | 2 | 250 | 10 | | 2,444 | 826 | 1,361 | 4,220 | | 204 | $300 | 353 | | 15,000 | 15 | 2,250 | | 10,687 | 7,473 |
| Shoe factory | E | | | 1 | 20 | | 1 | 75 | 1 | 10 | 1,144 | 277 | 394 | 1,280 | | 85 | | 395 | | | | 445 | | 3,626 | 2,952 |
| Automobile manufacturing | E | | | | | A | 4 | 450 | 2 | 10 | 2,310 | 937 | 2,016 | 5,165 | 519 | 216 | 400 | 1900 | | 25,500 | 15 | 3,825 | 80 | 15,352 | 11,160 |
| Steel mill | E | 4 | 1125 | 1 | 900 | F | 6 | 2100 | 17 | | 16,798 | 4548 | 12,300 | 36,300 | | 1020 | | | 3870 | 129,000 | 12.7 | 16,365 | | 76,901 | 78,552 |
| Chemical works | E | 3 | 320 | 1 | 45 | G | 16 | 3200 | 27 | | 28,943 | 2283 | | 47,419 | | 500 | | | | | | | | 79,145 | 69,000 |
| **COST OF PURCHASED POWER** | | | | | | | | | | | | | | | | | | | | | | | | |
| Fertilizer | E | 2 | 225 | 1 | 225 | | 2 | 700 | 7 | | $6,396 | $800 | 4,800 | $15,360 | | | | | | | | | | $24,056 |
| Fertilizer | E | 1 | 35 | | 187 | | 2 | 300 | 2 | | 1,820 | 200 | 1,000 | 3,200 | | | | | | | | | | |
| Office and manufacturing building | E | 2 | 150 | | | A | | | | 17 | 3,900 | 282 | 809-216 | 3,753 | $104 | $41 | | | | | | | | 7,872 |
| Office building | E | 2 | 150 | | | B | 2 | 300 | 6 | 24 | 4,130 | 400 | 1,200 | 3,840 | 60 | 130 | | $230 | | | | | | 7,686 |
| Hotel | P | 3 | 325 | | | C | 3 | 525 | 9 | 24 | 8,684 | 2750 | 4,200 | 15,540 | 480 | 600 | | | | $57,600 | 13 | $7,527 | | 35,581 | 30,564 |
| Chemical | E | | | | | | | | 7 | | 7,080 | 2340 | 6,696 | 14,664 | | 1164 | | | | 30,000 | 15 | 4,560 | | 29,808 | 23,440 |
| Grain elevator | P | | | | | | | | 14 | | 12,990 | 6500 | | 22,400 | 1200 | | | | | 300,000 | 11.5 | 34,500 | | 77,590 | 68,980 |
| Hotel† | E | 3 | 925 | | | D | | | 16 | 24 | 3,360 | 900 | | 25,326 | 720 | 1310 | | | | | | | | 31,616 | 31,515 |
| Apartment | E | 3 | 217.5 | | | E | 3 | 600 | 6 | 24 | 5,520 | 1650 | 2,900 | 11,165 | 465 | 342 | | | | | | | $170 | 19,142 | 18,378 |
| Manufacturing building | E | 3 | 300 | 2 | | | 5 | 1000 | 11 | | 10,192 | 1200 | 7,500 | 29,250 | 480 | 2552 | | | | | | | 163 | 43,844 | 35,778 |
| Manufacturing plant | P | 1 | 500 | | | A | | | 24 | | 8,190 | 3337 | 10,870 | 27,700 | | 4125 | | | $1000 | 46,385 | 13 | 6,030 | | 50,548 | 49,394 |
| Shoe factory | E | 3 | 250 | | | | 2 | 250 | 10 | | 2,444 | 826 | 1,361 | 4,220 | | 204 | $300 | 353 | | 15,000 | 15 | 2,250 | | 10,687 | 7,473 |
| Shoe factory | E | | | 1 | 20 | | 1 | 75 | 1 | 10 | 1,144 | 277 | 394 | 1,280 | | 85 | | 395 | | | | 445 | | 3,626 | 2,952 |
| Automobile manufacturing | E | | | | | A | 4 | 450 | 2 | 10 | 2,310 | 937 | 2,016 | 5,165 | 519 | 216 | 400 | 1900 | | 25,500 | 15 | 3,825 | 80 | 15,352 | 11,160 |
| Steel mill | E | 4 | 1125 | 1 | 900 | F | 6 | 2100 | 17 | | 16,798 | 4548 | 12,300 | 36,300 | | 1020 | | | 3870 | 129,000 | 12.7 | 16,365 | | 76,901 | 78,552 |
| Chemical works | E | 3 | 320 | 1 | 45 | G | 16 | 3200 | 27 | | 28,943 | 2283 | | 47,419 | | 500 | | | | | | | | 79,145 | 69,000 |

| Character of Business | Maximum Demand, Kw. | Annual Consumption, 1000 Kw.-hr. | Cost of Electricity Purchased | No. of Men | Cost of Labor | Supplies and Repairs | Tons of Coal | Cost of Coal | Ash and Coal Handling | Water | Superintendence | Total Plant Investment | Per Cent of Fixed Charge | Annual Fixed Charge | Boiler and Compensation Insurance | Total Annual Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fertilizer | 450 | 1644 | $17448 | 3 | $2,548 | $100 | 300 | $960 | | | | $25,000 | 12 | $3,000 | | $24,056 |
| Fertilizer | | | | | | | | | | | | | | | | |
| Office and manufacturing building | | 160.2 | 4,242 | | 1,794 | 55 | 507 | 1,739 | $40 | $2 | | | | | | 7,872 |
| Office building | 60 | 180 | 4,680 | 2 | 1,660 | 100 | 370 | 1,184 | 23 | 39 | | | | | | 7,686 |
| Hotel | 380 | 768 | 12,312 | 5 | 4,472 | 950 | 2100 | 7,770 | 240 | 400 | | 34,000 | 13 | 4,420 | | 30,564 |
| Chemical | | 2422 | 23,040 | | | | | | | | | 4,000 | 10 | 400 | | 23,440 |
| Grain elevator | | 2400 | 43,600 | 9 | 8,130 | 2500 | | 8,000 | 1000 | | | 50,000 | 11.5 | 5,750 | | 68,980 |
| Hotel† | | 1095.6 | 31,515 | 11 | | | | | | | | | | | | 31,515 |
| Apartment | | 250 | 10,000 | 3 | 1,560 | 550 | 1550 | 5,967 | 248 | 53 | | | | | $77 | 18,378 |
| Manufacturing building | | 688 | 21,325 | 5 | 5,148 | | 2000 | 7,800 | 128 | 1300 | | | | | 77 | 35,778 |
| Manufacturing plant | 375 | 2575 | 21,601 | | 7,176 | 1683 | 6796 | 17,329 | | 970 | $500 | | | | 135 | 49,394 |
| Shoe factory | 125 | 206 | 5,083 | 1 | 555 | 250 | 506 | 1,570 | | 15 | | | | | | 7,473 |
| Shoe factory | 30 | 10.5 | 1,697 | | 272 | 125 | 89 | 290 | | 10 | | | | 558 | | 2,952 |
| Automobile manufacturing | 160 | 360 | 7,100 | | | | | 3,150 | | | | 6,050 | 15 | 910 | | 11,160 |
| Steel mill | 1000 | 3192 | 52,368 | 5 | 5,220 | 1915 | 2820 | 8,330 | | 250 | 2196 | 73,250 | 11.3 | 8,271 | | 78,552 |
| Chemical works | 832 | 3856 | 50,604 | 16 | 15,636 | 600 | | | | | | | 13.5 | 16,000 | 2160 | 69,000 |

*"p" indicates proposed isolated plant, "E" existing. †Figures based on difference between cost with I. P. service and cost with central station service.
‡A, industrial; B, absorption, refrigeration, steam pumps; C, cooking and water heating; D, cooking and heating; E, water heating; F, miscellaneous, pumps and air compressors; G, pumps and air compressors.

In the accompanying table are presented data contained in a number of typical power sales reports. This table lists all the tangible cost items contained in the reports submitted, and while the tabulation will serve little or no purpose in the matter of estimating costs, it shows the number and relative importance of the different items that go to make up a power sales report.

Study of isolated-plant costs may be undertaken in two ways, the report states, namely, by investigating isolated-plant service as applied to particular classes of business or by investigating in detail every kind of apparatus that goes into isolated plants.

The conditions of service or the conditions of utilization of power and its by-products are so varied that investigation of power costs as applied to classes of business cannot be dispensed with. The committee submits data on service for office buildings, department stores and hotels as this year's contribution to the study of classes of service.

The matter of fixed charge against investment made in isolated plants may profitably be subjected to some discussion, the committee feels, in view of the difference in practice brought out by the analysis in the power sales reports in the table.

The items that go to make up the fixed charge are interest, depreciation, insurance and taxes, and a suitable percentage to cover the risk incurred in making the investment.

The majority of reports, it is stated, do not show any fixed charge against existing plants. In the opinion of the committee it would seem to be better practice in all cases to include in the power sales report the full amount of fixed charges so that the true cost of power would be recorded and not merely the operating cost. This procedure would contribute to the economic education of the customer, and he would not be so apt to lose sight of the factor of proper investment charges in his future undertakings. After the full amount of fixed charges has been included, qualifications pertaining to the conditions prevailing at the time of the negotiation may be made.

## HEAVY STOCKING OF MOTORS IS FOUND VERY PROFITABLE

### "Readiness to Serve" Industrial Companies Emphasized as a Policy Measure That Will Prove of Great Timely Value

Foresight in anticipating the demands of power customers for electric motors is a prime essential to prompt service installations and extensions by central stations. One company which maintains an average stock of several hundred motors, representing an investment of about $25,000, found that by selling these at list prices the total salaries of the power engineering department in 1916 were covered by the profits on motor sales, while immediate deliveries were made to customers to boot. Within a fortnight two orders for induction motors aggregating $37,000 have been placed, and it is likely that many of these units will be shipped from the factory direct to the power user instead of being passed into the central station stock.

The policy of selling at list price and adjusting this to market conditions stabilizes relations with local contractors and dealers. Greatly improved deliveries are the result of the company's policy, and the good effect of its "readiness to supply" upon the local community of power users is worth emphasizing as a point in company policy. Customers frequently order motors by mail, and the company maintains a standard range of sizes of from 1 hp. to 100 hp., the most common size used being 5 hp. The purchase of motors on a large scale for stock has been found to be one of the most profitable undertakings of the company.

## SUFFICIENT MARGIN FOR HANDLING WIRING CONTRACTS

### By Charging Contractors 10 Per Cent for Financing Central Station, Company Is Enabled to Carry Business Without Loss

About four years ago the Rockford (Ill.) Electric Company adopted a plan for financing the wiring of residences in its territory which was designed to assist the electrical contractors in the city. A flat price per outlet schedule was arranged with the contractor, and it was agreed that the central station should deduct a margin of 10 per cent from the contractor to cover its expense in handling the business. W. A. Griffin, in speaking of the success of the plan before the commercial men of the Illinois State Electrical Association, showed that this margin had been a little more than sufficient to cover all contingent expenses. The data given by the speaker on the business conducted under this plan are as follows:

| | | |
|---|---|---|
| Total amount of contracts | | $34,584.00 |
| Amount deducted by the central station company (10 per cent) | | $3,458.40 |
| Contingent expenses: | | |
| Interest | $1,209.78 | |
| (The average amount outstanding was $5,040.77, and the above interest was figured on that amount at 6 per cent for one-half of the period.) | | |
| Accounting and collection expenses | 1,380.00 | |
| Losses from accounts uncollectible | 171.03 | |
| Total contingent expenses | | 2,760.81 |
| Excess of amount received over amount expended | | $697.59 |
| Estimated revenue received during the four years from 1034 contracts secured under this plan | | $41,360.00 |

It is interesting to observe from these figures that the company's loss from uncollectible accounts is less than 0.5 per cent of the total amount of the contracts handled. The fact that the average amount outstanding against the company was approximately $5,000, while about $8,500 worth of work was handled per year, is also of interest, in view of the fact that the company gave its patrons twenty-four months in which to complete payment of the wiring account. In Rockford line extensions in the residential districts were started only about ten years ago. During the last five years a vigorous all-year-round wiring campaign has been under way, and as a result about 51 per cent of the homes in the city are now enjoying electric service.

## Chart for Reducing the Cost of Billing

The article on page 660 of the ELECTRICAL WORLD for April 7, 1917, regarding a billing chart used by the Marshall County Power & Light Company, Blue Rapids, Kan., whereby 50 per cent of the billing time is conserved, stated that "Similarly, the bill for a consumption of 118 kw.-hr. is found in column 8 [of the chart] opposite 110, reading $8.48." This, of course, should have read $9.08.

# ADVANCE IN TECHNICAL THEORY AND PRACTICE

*Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World*

## ELECTRIC HEATING AND THE CENTRAL STATION

### The Immense and Practically Untouched Field of Electrothermal Processes Requiring Comparatively Low Temperatures

THE meeting of the American Electrochemical Society held in Detroit, Mich., from May 2 to 5, brought out some very interesting electric furnace papers, especially on electric steel, and some very suggestive discussions of the relation between electric heating processes and the central station.

Without going into details of the electric steel papers we may quote from the paper of Dr. John A. Mathews, president of the Halcomb Steel Company, that the infant American electric steel industry already represents an output about eight times as great as the crucible-steel production and one-eighth that of Bessemer production. The discussion brought out data on two large new electric steel plants. At Toronto the Canadian government has in course of construction what will be the largest cold-charge electric steel plant, comprising ten Heroult furnaces of 6 tons (5.45 t.) each for cold melting for the production of shell steel. At South Chicago the United States Steel Corporation intends to make an installation in which molten metal from Bessemer converters will be transferred to two 250-ton (227 t.) open-hearth furnaces (acting as reservoirs) to be finally refined in ten electric Heroult furnaces of 30 tons (27.2 t.) capacity each. This will be the largest electric steel plant in the world, as the whole capacity of this triplex process will be 50,000 tons (45,300 t.) of steel per month.

During the meeting an excursion was made to two electric steel plants in Detroit. Both are supplied with electrical energy from the Detroit Edison Company and it is interesting to note that the rate charged for electrical energy is the same as that charged for electric motor service.

#### Processes of Electric Heating Requiring Comparatively Low Temperatures

From the central station engineer's viewpoint, however, the most interesting discussions, probably, during the meeting related not to electric furnaces (as commonly understood requiring exceptionally high temperatures) but to electric heating processes requiring comparatively low temperatures. Here is a wide and almost virgin field for central station activity, as pointed out in the paper by Dr. C. F. Hirshfeld, head of the research department of the Detroit Edison Company, on "low-temperature electrothermal processes." The term "low temperature" may be taken as referring to temperatures below about 290 deg. C. (554 deg. Fahr.). Such temperatures are below practically all commercial metal-melting temperatures but are common in numerous baking and drying operations which form a surprisingly large part of industrial processes. The exploitation of electric heating for such low temperatures in industrial practice is really comparatively old, since numerous small electrically heated appliances operating at such temperatures have been used as a matter of convenience in manufacturing establishments for a number of years. During the last few years, however, the use of electric heating for such temperatures has been adopted in cases calling for the installation of equipments with capacities ranging from several hundred to several thousand kilowatts. This is obviously a different sort of a proposition, and must be based on a far broader consideration than mere convenience.

#### Electric Japanning Furnaces

The first example discussed at length in Dr. Hirshfeld's paper relates to electric japanning furnaces. An installation of this kind may be seen in operation in the Dodge automobile factory, Detroit. The development of the electric japanning process is discussed at great length in the paper. At the time when electrification started it was customary to bake japan in direct-fired gas ovens in most plants. In these ovens gas is burned within the space in which the work is inclosed, and the products of combustion bake the work during the entire process. Temperatures of the order of 180 deg. C. (356 deg. Fahr.) were considered the maximum allowable, and from one and one-half to three hours were required per bake. For good work which was to show a fine finish and was to resist wear and weather three or more coats were deemed necessary. It was found to be particularly difficult to be sure of obtaining a high gloss, and the weathering qualities of work made under what were supposed to be exactly similar conditions were remarkably diverse.

When the electric japanning process had been developed it was found that while baking of the coats in the gas oven consumed a total of five and a half hours, the three corresponding coats were baked electrically in two hours and forty minutes.

Inspection of pieces baked in direct-fired gas ovens and similar pieces baked in electrically heated ovens always shows that the electrically baked material has a higher and more perfect gloss or finish.

The reasons for this are discussed at some length and notes are added on certain experiments conducted on a small scale for the purpose of determining the relative effects of baking by pure convection, baking by combined radiation and convection and baking by heating of the metal itself. For this purpose similar samples, dipped in the same japan, were baked in bottles. For convection baking filtered air was heated in an electric oven to the proper temperature and was then drawn through a bottle in such a way as to make it bathe the inclosed sample. For combined convection and radiation, the sample was surrounded by electric

heaters inclosed with it in a bottle, the volatiles being drawn off and circulation being maintained by means of a small laboratory pump. For baking by internal heating the bottle and its inclosed sample were suspended in an alternating magnetic field of sufficient intensity to give the desired temperature gradient. During baking volatiles were removed by a small laboratory pump.

It is of particular interest to note that baking by internal heating is essentially an electrical method, and that it is far removed in every way from methods previously in use. It is further important to note that with this method a maximum metal temperature of the order of 170 deg. C. (338 deg. Fahr.) and a bake of 15 minutes are perfectly capable of giving better results than can be obtained with external electric heating with 45-minute bake and a maximum temperature of 230 deg. C. (446 deg. Fahr.). It also seems probable that one coat baked in this way will prove the equal of two or three baked by the older methods. The effect of all this upon energy charges for a given weight of metal baked is perfectly obvious.

It seems hardly necessary to discuss at greater length the various phases of the japanning art. It should be evident that electric heating opens up opportunities for improving the product and the production methods used in obtaining that product. It should also be evident that electric heating is capable of reducing factory operations in this field to so exact a procedure that accurate laboratory control is made possible. With industrial conditions brought to this point it becomes possible for research chemists to work to advantage toward the improvement of the japans themselves and toward the improvement of the methods of their utilization.

The second example discussed by Dr. Hirshfeld related to the electric baking of foundry cores, which also seems a very promising field. There are numerous other low-temperature baking processes, and the majority are in the same undeveloped state as are the two cited above. One very important field in which little has been done is the baking of foodstuffs, such as bread and other cereal products. Electric heating has been applied to the baking of such materials in several cases with very gratifying results, improving both the appearance and quality of the product.

The introduction of electrical methods for such purposes as enumerated above should be of particular interest to the chemist, because it makes it possible to reproduce on an industrial scale a sequence of operations and conditions which have been worked out on a small scale in the laboratory. It makes it possible to control industrial production to the same extent that laboratory investigations are controllable, and it thus opens to the chemist in the industrial field a tremendous opportunity for improvement of product and increased production.

In the extended discussion of the paper Dr. Hirshfeld emphasized that the cost of energy is by no means necessarily the vital point. Ten years ago japanning was done by coal and coke firing. The change to gas heating involved an energy differential of 18 to 1, but the higher cost of the gas was considered of minor importance. Why not now change to electric heating where the differential is so many times smaller than in the former case?

## Lamps and Lighting

*Glasses for Protecting the Eyes.*—W. W. COBLENTZ and W. B. EMERSON.—A paper giving data on certain newly developed glasses for protecting the eye from radiant energy, especially from the ultra-violet and the infra-red or so-called heat rays. For protecting the eye from ultra-violet light, black, amber, green, greenish-yellow, and red glasses are effective. Spectacles made of white crown glass afford some protection from the extreme ultra-violet rays which come from mercury-in-quartz lamps and from electric arcs between iron, copper or carbon. The vapors from these arcs emit only little infra-red radiation in comparison with the amount emitted in the visible and in the ultra-violet. For shielding the eye from infra-red rays deep-black, yellowish-green, sage-green, gold-plated and bluish-green glasses are the most serviceable. For working near furnaces of molten iron or glass, if considerable light is needed, a light bluish-green or sage-green glass is efficient in obstructing the infra-red rays. For working molten quartz, operating oxy-acetylene or electric welding apparatus, searchlights, or other intense sources of light, it is important to wear the darkest glasses one can use, whether black, green (including gold-plated glasses), or yellowish-green, in order to obstruct not only the infra-red but also the visible and the ultra-violet rays. With respect to infra-red rays emitted by a furnace heated to 1000 to 1100 deg. C. about 99 per cent are obstructed by gold-plated glasses, about 95 per cent by sage-green or bluish-green glasses, about 60 to 80 per cent by very deep-black glasses, and about 60 per cent by greenish-yellow glasses.—*Technologic Paper, Bureau of Standards*, No. 93, May 5, 1917.

## Generation, Transmission and Distribution

*High-Tension Overhead Transmission Lines.*—G. V. TWISS.—The first part of an illustrated article of which a summary is given as follows: The author discusses the subject comprehensively, dealing first with the general design of transmission lines. A comparison is drawn between the factors of safety required in Great Britain and those in Canada and the United States. Curves are given for facilitating calculations of cost. In dealing with line materials, a comparison is drawn between the pin-type of insulator and the suspension type. The Hewlett and metal hooded insulators are discussed at some length. Finally, the mechanical design and the testing of insulators are considered.—London *Electrician*, April 27, 1917.

## Electrophysics and Magnetism

*Effect of Cross-Magnetizing Fields Upon Hysteresis.*—N. H. WILLIAMS.—An abstract of an American Physical Society paper. The effect of an alternating field applied at right angles to the direct field while the hysteresis curve was being traced was investigated by the author for steel specimens of varying degrees of hardness. The direct field reached a magnitude of 150 gausses, while an alternating field of maximum intensity, 80 gausses, was applied in some cases. With soft specimens all traces of hysteresis disappeared, while with very hard steel it was reduced till the width of the curve was less than a tenth of the width of the original curve. For soft specimens the magnetization curve with the alternating field applied lies almost

wholly outside and beneath the normal hysteresis curve. For hard steel it lies within the normal curve, except near the top, where it passes outside and above it. It has been possible to compute the induction that should correspond to any field intensity, and points thus determined are found to lie very near to the experimental curve. Their slight deviation from the experimental curve points to two conclusions: (1) The observed effects are not due to mechanical shock, as has been supposed by some. (2) With hard specimens there is a distinct rotational hysteresis or tendency for a flux to maintain its magnitude as it is forced to change its direction.—*Phys. Review*, April, 1917.

*Electric Strength of Air and Measurement of High Voltages.*—J. B. WHITEHEAD.—A Franklin Institute paper on the electric strength of air and methods of measuring high voltages. After discussing the needle gap and the sphere gap the author deals at considerable length with the corona voltmeter, its construction, application and calibration.—*Journal Franklin Institute*, April, 1917.

## Telegraphy, Telephony and Signals

*The Use of the Einthoven Galvanometer and a Detector of the Audion Type for Measuring the Strength of Radiotelegraphic Signals.*—One of the important determinations to be made in radiotelegraphy is the measurement of signal strength at a receiving station. For making quantitative measurements it is very convenient to record the signals by means of an Einthoven galvanometer and a suitable photographic device. A permanent record is thereby obtained which can be measured accurately at the leisure of the observer. As a detector the author uses a vacuum-bulb detector which is sensitive and not easily thrown out of adjustment. A difficulty arises in its use from the fact that a battery with a large electromotive force is used in the plate circuit. A current of about one milliampere flows in this circuit whenever the detector is in use, thus making it impossible to use a sufficiently sensitive galvanometer directly in the receiver circuit. To avoid this difficulty the arrangement shown in Fig. 1 was used. The current which is continually flowing through the plate circuit causes a potential drop to exist across

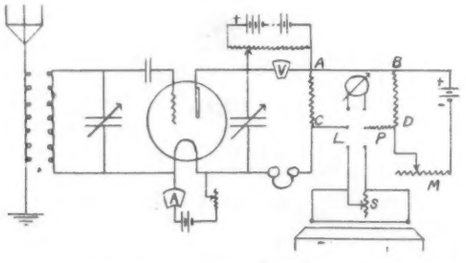


FIG. 1—CONNECTIONS FOR MEASURING THE STRENGTH OF RADIOTELEGRAPHIC SIGNALS

the resistance *A-C* in the circuit. This is balanced by an equal potential drop across a resistance *BD* in an auxiliary circuit. The two circuits are connected together at the point *AB* and the galvanometer is placed between the two circuits at *CD*. When no signals are being received the galvanometer should show no deflection. When signals are received the potential drop *AC* changes, thereby creating a difference of potential between *C* and *D* and causing a deflection of the galvanometer. If this galvanometer is of the Einthoven type it will follow the variations of the current with the reception of dots and dashes. It was found convenient to keep both of the resistances *AC* and *BD* constant at about 2000 ohms and to secure a balance by varying an additional resistance, *M*, in series with the auxiliary battery. Some further refinements are described together with results obtained by this method. —*Phys. Rev.*, May, 1917.

*Determining the Audibility Current of a Telephone Receiver.*—EDWARD W. WASHBURN.—A long abstract of

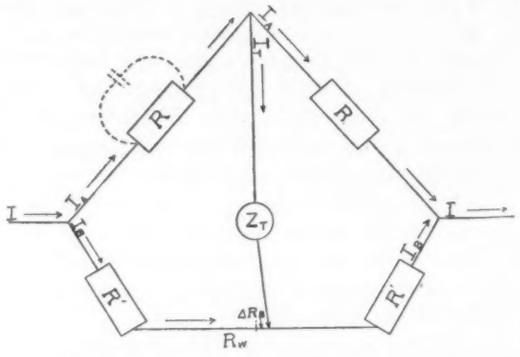


FIG. 2—ARRANGEMENTS FOR MEASURING AUDIBILITY CURRENT

a paper presented at the Chicago meeting of the American Physical Society. Audibility current is the current which must pass through the telephone in order to produce a sound which can just be recognized. The curve connecting the audibility current of a telephone with the frequency of the impressed emf. is a valuable indication of the field of usefulness of the instrument. The author describes a method using a Wheatstone bridge arrangement as shown in Fig. 2. The resistances *R* and *R'* should be substantially free from both inductance and capacity. For low-resistance telephones Curtis coils would fulfill this condition sufficiently well, but for high-resistance telephones, especially at the higher frequencies, film resistances would be preferable. The two resistances marked *R'* are connected by a stretched wire of suitable resistance ($R_w$), provided with a scale and a sliding contact. The telephone is connected to this sliding contact and to a point between the two resistances *R* as indicated. A small variable air condenser connected where it is required is employed to insure the exact balancing of reactances. The resistance of that portion of the slide wire lying between its central point and the position occupied by the sliding contact when the audibility current, $I_r$, is passing through the telephone will be designated by $\Delta R_B$. The current *I* comes from a high-frequency generator whose frequency can be controlled and kept constant at any desired value. It enters the bridge network at the left and divides as indicated. In series with the bridge is placed a vacuum thermocouple (not shown in the figure) connected to a sensitive millivoltmeter. This instrument indicates the magnitude of the current *I*. For high-resistance telephones a hot-wire ammeter could be employed. The procedure consists in adjusting the current *I* until the range of silence on the slide wire is found to have a convenient measurable value. This range of silence is obviously equal to $2\Delta R_B$ ohms. The value of $I_r$ is then obtained from the equation of the Wheatstone bridge. Further simplifications of the method and a numerical example are added.—*Phys. Review*, May, 1917.

# NEWS OF THE INDUSTRY

*Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields*

## ELECTRICAL MANUFACTURERS' ACCOUNTING AND COST SYSTEM

### Electrical Manufacturers' Council Makes Preliminary Issue of System Which Has Received Approval of Federal Trade Commission

The Electrical Manufacturers' Council has made a preliminary issue of a standardized accounting and cost system for the electrical manufacturing industry.

S. L. Nicholson, Westinghouse Electric & Manufacturing Company, chairman of the council, in an introduction gives a brief history of the movement for standardization of accounting and cost methods. The three organizations, embracing 197 member companies, represented by the council are the Electrical Manufacturers' Club, the Electric Power Club and the Associated

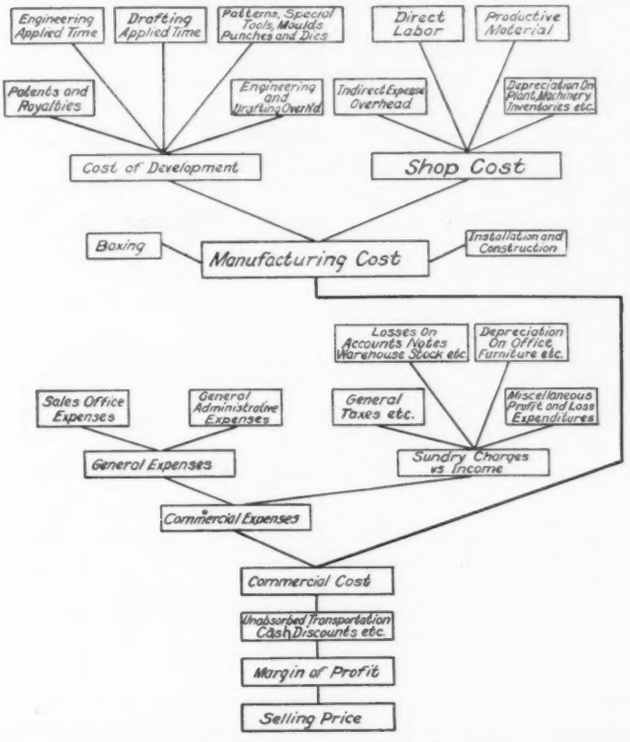


DIAGRAM OF THE ELEMENTS OF COST

Manufacturers of Electrical Supplies. The committee on the standardization of accounting and costs, appointed by the council, was chosen with reference to an adequate representation of all classes of manufacturers, large and small, simple and complex, Eastern and Western, etc., and was as follows:

American Conduit Manufacturing Company, Pittsburgh, Pa. (D. H. Murphy).

Belden Manufacturing Company, Chicago, Ill. (J. C. Belden).

Cutler-Hammer Manufacturing Company, Milwaukee, Wis. (H. F. Vogt).

D. & W. Fuse Company, Providence, R. I. (M. J. Offers).

General Electric Company, Schenectady, N. Y. (C. E. Patterson).

Harvey Hubbell, Incorporated, Bridgeport, Conn. (Harvey Hubbell).

Robbins-Myers Company, Springfield, Ohio (C. C. Miner).

Safety Insulated Wire & Cable Company, New York, N. Y. (LeRoy Clark).

Wagner Electric Manufacturing Company, St. Louis, Mo. (W. S. Thomas).

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. (J. C. Bennett).

The system developed by this committee has been approved by the Federal Trade Commission through Edward N. Hurley, chairman at the time the accounts were submitted. The council now submits the system for adoption by the three organizations of manufacturers. It has voted to continue the present committee as a standing unit on uniform accounting and cost methods. All questions and suggestions regarding the system may be addressed to C. E. Patterson, General Electric Company, Room 2059, 120 Broadway, New York.

Mr. Patterson, chairman of the committee, says the system "has been so planned that it not only conforms to the requirements of scientific accounting and an adequate cost system, but is sufficiently flexible so that it may be used to advantage by both large and small manufacturers."

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## A. I. E. E. MEETING PLANS ARE CHANGED BY WAR SITUATION

### Proposed Four-Day Convention at Hot Springs Is Abandoned—Special Two-Day Meeting in New York, June 27 and 28

Discussion at a meeting of the board of directors of the American Institute of Electrical Engineers held in New York on May 18 showed that on account of the national situation a large number of the active members who usually attend the annual convention would not be able to spare the time this year to go to the proposed four-day meeting at Hot Springs, Va. Many of the members have already received commissions in the Engineer Officers' Reserve Corps of the army, and a large number are or soon will be in the service of the government in various other capacities. In view of these facts the directors decided that it would not be feasible to hold the proposed convention at Hot Springs.

It has been decided, however, to hold a special two-day meeting in New York, June 27 and 28, for presentation and discussion of papers that were to have been presented at the annual convention.

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## Iowa Convention Postponed

The Iowa Section of the National Electric Light Association decided to abandon its convention, scheduled to be held at Des Moines on May 24 and 25, 1917.

## THE LIBERTY LOAN AND ELECTRICAL FINANCING

By F. A. VANDERLIP

*To the Electrical World:*

I have your letter of May 18 and am very glad to answer your two questions.

How can electrical companies assist in placing the "Liberty Loan"?

In reply to this question, I would say that the electrical companies can assist in the distribution of the Liberty Loan—

(1) By subscribing for their own account;

(2) By making it easy for every employee to subscribe and by seeing to it that every employee does subscribe;

(3) By sending out with all bills and notices an inclosure, which may be secured from the Liberty Loan committee in New York, giving reasons why customers should purchase Liberty Loan bonds and giving information as to how subscriptions may be entered;

(4) By granting facilities gratuitously to the publicity committees in towns where the electrical companies have headquarters or branches for the purpose of giving general advertisement to the Liberty Loan (signs, etc.).

What temporary and permanent effect will the government needs have upon the financing of public utilities?

In reply to the second question, I would say that it is obvious that, with industrial activity incident to the expenditure of large sums of money by the United States government, factories will be unusually busy and laborers will all be busy and working at high wages. This should mean a large sale of energy for electric light and power. At the same time, we must recognize that we are facing a period of unnecessary inflation, that there will be the usual phenomena accompanying inflation, that is, higher prices. The "cost of living" to corporations will go up as it does for individuals, but public service corporations cannot raise their rates as their costs advance. I do not believe that any expenditure that is unnecessary or that can just as well be postponed ought to be made by corporations, any more than an unnecessary expenditure should be made by an individual. We are giving the government $7,000,000,000 of purchasing power; our business is war; we cannot continue to have the same purchasing power ourselves while the government is exercising this purchasing power. We must compete with the government for labor; we must organize the nation for war. Those things that employ labor and can wait should wait.

F. A. VANDERLIP,
President the National City Bank of New York.

## Seeking Men for New York National Guard

Every effort is being made to raise 10,000 recruits for the National Guard organization in New York State so as to increase it from the ordinary peace basis to war strength. The work is being carried on through various industries with the object not only of enlisting the required number of men, but also of getting those trained in some lines that are necessary to a complete and most effective organization. It is for this reason that the attention of readers of the ELECTRICAL WORLD is called to the desire of Governor Whitman and the authorities to enlist men in the electrical industries, where available, as well as others who can serve.

## CHANGES IN WAR TAX BILL ASKED ON BEHALF OF N. E. L. A.

### E. W. Burdett, C. L. Edgar and Arthur Williams Seek to Remove Ambiguities and Prevent Double Taxation

Everett W. Burdett, Charles L. Edgar and Arthur Williams have presented, as a committee of the National Electric Light Association, a statement to Congress asking that changes be made in the war tax bill. The statement is as follows:

The undersigned are a committee of the National Electric Light Association, duly appointed to bring the following considerations to the attention of the committee on ways and means of the House of Representatives and the committee on finance of the Senate. The chairman, Mr. Burdett, is also acting in the capacity of general counsel of the association.

The N. E. L. A. comprises in its membership about 1200 companies in this country and Canada engaged in the production, distribution and sale of electricity, comprising about 95 per cent of those engaged in that industry in this country.

We are not asking for any exemption or reduction in the taxes proposed to be levied upon the services rendered by the companies which we represent. Our purposes are twofold:

1. To remove ambiguities now apparent in the bill.
2. To prevent double taxation and discrimination.

Our specific suggestions are as follows:

I. Change the wording of Title V (page 19 of printed bill) to read as follows:

"Title V. War tax on certain transportation, electric, gas, steam, telephone and telegraph services and facilities, advertising and insurance."

II. In Section 500 (page 21, lines 1 and 2) strike out the words "electric power for domestic uses and of the amount paid for light or heat," and substitute therefor the words "electricity, gas and steam for domestic or household uses."

III. In Section 500 (page 21, line 5) insert after the word "provided" the words:

"That only one payment of such tax shall be required, notwithstanding the lines or facilities of one or more persons, corporations, partnerships or associations shall be used in furnishing such electricity, gas, steam or telephone services; and provided."

IV. In Section 4, page 5, at the end of line 18, add the words:

"Provided that the income derived from dividends upon stock of other corporations, joint stock companies or associations, or insurance companies, which are subject to the tax imposed by said Section 10 and this section, shall be exempt from the provisions of said Section 10 and of this section."

In support of these suggestions we beg leave to submit the following considerations:

I. The reason for this change is to indicate that the purpose of the bill is to bring within its scope certain services furnished by any persons, firms or corporations, whether or not they are technically "public utilities." The character of the seller is immaterial; the important thing is to reach all users of certain services, by whomsoever furnished. The title as it now stands indicates an intention of limiting the tax to services supplied by "public utilities" only, and thus discriminates between persons, firms and corporations engaged in the same business although not all technically within the definition of "public utilities."

II. Our reasons for the change suggested in Sub-section (e) of Section 500 are as follows:

(1) The phraseology as it now stands is meaningless, in that it undertakes to impose a tax on the use to which a thing is put instead of upon the thing itself. It is not the use which is sold, but the service or commodity. As a matter of fact, a company does not sell "electric power for domestic uses," or "light or heat," as such,

but sells electricity or electric energy, which the customer may put to any service which he desires. In the great majority of cases electric service for light, heat and power is given by the use of the same wires and is measured by the same meter. To separate these services so that each could be metered separately would require an entirely independent set of wires. Consumers would therefore have to spend large amounts of money for duplicate wiring, or else confine their service to either light, heat or power alone, whichever they considered of the most value to them.

(2) The word "domestic" is ambiguous, as it may properly be used in several different senses. We assume that the purpose is to secure a tax upon any use of electricity, gas or steam for domestic or household purposes, as distinguished from their use for commercial or manufacturing purposes. In the latter cases the government secures its taxes in other ways. We therefore suggest the phrase "domestic or household" uses.

III. The proviso at the end of Section 500, page 21, carefully eliminates the possibility of double taxation in the case of telegraph and telephone dispatches, messages or conversations. There is no reason whatever why the same security should not be given against double taxation for the services rendered by electric and gas companies. If there were no proviso in the section, it might fairly be claimed that no double taxation is involved; but the existence of a proviso confined to certain telegraphic and telephonic services might give strong ground for the claim that no such exemption was intended in the case of gas and electric services. We therefore urge the importance of such an amendment as the one above suggested.

IV. The income tax of 2 per cent, which it is now proposed by this bill to make 4 per cent, should be exacted from all corporations alike. Many companies are required to maintain separate company organizations to legally carry on their business, and under the bill as now drawn such companies would be obliged to pay a tax of 8 per cent (paying the 4 per cent twice) upon the net income received, while other companies not so situated would be obliged to pay only 4 per cent of their net income received from any stated business that it is intended should be taxed. Obviously, this tax should not be doubled in certain cases because of the necessary method of carrying on the business.

The foregoing is a brief statement of the changes which we propose and the reasons therefor. We would be very glad of an opportunity to appear personally before the committee or any member or members thereof for the purpose of stating with more particularity the necessity for and the propriety of the amendments which we suggest.

We are authorized to add that Edmund W. Wakelee, vice-president of the Public Service Corporation of New Jersey, who has heretofore appeared and submitted to the committee certain proposed changes in the bill, has been over those herein stated with care, and adopts them in place of his own, requesting that the latter be considered as withdrawn.

By a vote of 116 to 58 the House of Representatives has refused to eliminate from the war revenue tax bill the tax at 5 per cent on the amount paid for electric power for domestic uses and on the amount paid for light and heat. The Senate has not yet acted.

## SUBSCRIPTION TO THE WORLD'S LIBERTY LOAN

### General Electric Company Takes $5,000,000, and Announces Plan Whereby Employees May Take Additional Amounts in Installments

The General Electric Company has subscribed $5,000,000 to the Liberty Loan. It has also perfected a plan whereby employees may arrange to buy bonds on installments, independently of its own subscription.

## NATIONAL COMMITTEE ON GAS AND ELECTRIC SERVICE

### Organization Follows Authority Granted at N. E. L. A. War Convention—John W. Lieb Chairman—Washington Office Opened

Following the plan approved at the war convention of the National Electric Light Association to promote the fullest measure of co-operation by electric and gas utilities with the national government a "National Committee on Gas and Electric Service" was formed in Washington on May 18. The members are:

Chairman, J. W. Lieb, vice-president New York Edison Company and president N. E. L. A.; vice-chairman, William H. Gartley, chief engineer United Gas Improvement Company; secretary, G. W. Elliott; Walter R. Addicks, vice-president Consolidated Gas Company, New York; Philip P. Barton, vice-president Niagara Falls Power Company; John A. Britton, vice-president Pacific Gas & Electric Company; Alex Dow, president Detroit Edison Company; Charles L. Edgar, president Edison Electric Illuminating Company, Boston; A. E. Forstall, president American Gas Institute; Samuel Insull, president Commonwealth Edison Company, Chicago; Dr. D. C. Jackson, Massachusetts Institute of Technology; Joseph B. McCall, president Philadelphia Electric Company; Capt. William E. McKay, vice-president New England Gas & Coke Company, Boston; Herbert A. Wagner, president Consolidated Gas, Electric Light & Power Company, Baltimore; S. S. Wyer, consulting engineer Natural Gas Association, Columbus, Ohio.

Mr. Elliott, who offered to serve without compensation, will be in charge of the office which has been opened in the Munsey Building, Washington. J. B. Klumpp and Walter Neumuller will assist Mr. Elliott.

The committee will issue a circular urging electric and gas companies to inventory their man-power, dividing employees into classes according to the degree in which they are not essential, are desirable or are imperative in operation and to forward the total numbers of each of these three groups to the committee.

It was also decided that the companies should be advised that the committee is bringing to the attention of the proper authorities the question of giving these utilities preference in coal supply and also the imperative or immediate needs of each company so far as it may be affected by war conditions. To assist in this work gas and electric companies are requested to file data with the committee promptly in answer to a questionnaire which the committee is forwarding.


## WHY IT IS THE "LIBERTY LOAN"

It is a loan from a free people to help to free the world.

It is a loan gladly made by a people who enjoy the priceless benefits and heritage of liberty to aid in establishing liberty in Europe and on the broad ocean highways.

Through it the largest and most prosperous nation of democracy gives strength to the worldwide cause of democracy.

DENOMINATIONS.—Coupon Bonds: $50, $100, $500, $1,000. Registered Bonds: $100, $500, $1,000, $5,000, $10,000, $50,000, $100,000.

# ELECTRICAL SUPPLY JOBBERS TALK OF BUSINESS CONDITIONS

## Large Gathering at Hot Springs, Va., to Discuss Problems Brought by War—$10,000 for Liberty Loan Bonds, $2,000 for Ambulance

The most successful meeting in point of attendance and of interest held by the Electrical Supply Jobbers' Association in some years convened at Hot Springs, Va., on Tuesday, Wednesday and Thursday of this week. All sections of the country, including the Pacific Coast and Southwest, were represented, and the peculiar business situation now confronting the electrical jobbers of the country as a result of war conditions was intimately discussed from every angle.

In addition to the regular meetings of the general association, two meetings of the Atlantic division, presided over by W. E. Robertson of Buffalo, were held on Tuesday as well as two meetings of the Central division under the leadership of Frank M. Bernardin of Kansas City.

Nor were the members so absorbed in business as to forget the spirit of patriotism now pervading the country, for the general secretary, Franklin Overbagh, was directed to purchase out of the funds of the association $10,000 worth of Liberty Loan bonds and a sum not exceeding $2,000 was also authorized for the purchase of an ambulance for service in France.

Three addresses were made at the Wednesday afternoon session on subjects in which the jobbers are at present vitally interested—one by Capt. Edwin W. Moore, president Habirshaw Electric Cable Company, on "The Wire Problem"; another by C. E. Corrigan, vice-president National Metal Molding Company of Pittsburgh, on "Rigid Conduit," and the third, on "Selling Electrical Service," by James M. Wakeman, Society for Electrical Development.

At the meetings of both the Atlantic and Central divisions the conduit, wire and socket situations were canvassed. The Atlantic division in particular had a very elaborate program mapped out and its session lasted till midnight on Tuesday without abatement of interest. A consensus of opinion was obtained from all present on the percentage increase of stocks on hand at the beginning of this year as compared with the years of 1915 and 1916, the percentage increase in the value of the stocks so carried, and the necessity of a reserve fund as a safeguard when prices begin to go back to normal.

In fact, the first session alone of the Atlantic division was admittedly one of the best ever held so far as impressing members with the fundamentals of legitimate business was concerned. The aim was to crystallize thought on the part of jobbers in certain definite directions so that each could reason out for himself what steps he ought to take to survive any abrupt change from above normal to below normal conditions in the market. The program as carried out was as follows:

### Program of the Atlantic Division

(1) Is the jobbers' stock on a numerical and tonnage basis now above or below normal?

(2) Assuming that, figured on a numerical basis and on a tonnage basis, jobbers' stocks for May, 1915, and May, 1917, are practically identical, what is the percentage of increase in value on May 1, 1917, and to what level will values recede and over what period of time?

(3) What has been the average per capita increase in pay of employees since May 1, 1915, and how can this be reduced to normal?

(4) What will be the probable demand for materials due to building operations under way and projected?

(5) What is the condition of the iron conduit market, embracing (a) raw and finished manufacturers' stocks on hand and in process, (b) jobbers' stocks on hand and on order, (c) the outlook?

(6) What is the condition of the schedule material market as to manufacturers' stocks, unfilled orders, raw materials and labor conditions that enter into the cost of production, together with jobbers' stocks on hand?

(7) What is the condition in the flexible-conduit market, including metallic, non-metallic and armored conductors?

(8) Do present conditions in the copper market warrant jobbers to expect lower prices for copper during the next six months, taking into consideration conditions in the following: (a) mining, (b) smelting, (c) domestic demand, (d) foreign demand?

(9) Do present conditions in the steel market warrant jobbers to expect lower prices for steel during the next six months?

There was also some discussion on the probable duration of the war and what effect peace negotiations would have on the electrical supply market.

### The Wire Problem

In his address Captain Moore outlined the merchandising functions of the jobbers and of the contractors and dealers and the relations that should exist between them and the manufacturers. He said in part:

"One of the essential factors in stabilizing business and preventing demoralization in price is establishing among manufacturers, contractors and jobbers an accurate system of cost accounting. The lack of such a system lies at the foundation of destructive competition.

"So far as we are concerned, we do not regard wire as sold until it is actually installed in service; in other words, we feel that after we have made our sale to the jobber it is up to us to help him with the sale of the wire to the contractor, and that after that we must help the contractor to sell it to the owner.

"Every one of our policies, therefore, is carefully scrutinized from the owner's point of view. We believe that there is nothing in the long run that will prove so economical to the consumer as distribution through the jobber and the contractor. You will note that we say 'economical'—not 'cheap.'

"We believe, as we have said, that we are not far from solving this proposition, and when we have solved it and have created a satisfactory market for our material with the contractor's customers we have no doubt in the world that he will see the wisdom of dealing with the jobber, and that he will establish fair and satisfactory relations with him. We believe that within a short time we will be able to see our business flow through regular channels.

"It is our intention to protect the jobber in every way possible. We realize that the jobber is severely handicapped in doing business by the necessity of carrying a stock, by the maintenance of a warehouse, and by the credit risk which he is absolutely obliged to take in the case of a large number of small customers; and for these reasons we think the jobber should be protected by granting him a lower price than any one else will receive who does not accept the same obligations.

"The same applies to the contractor. As he lightens his burdens by making the jobber carry a large stock

and a large force of salesmen, while he himself is carrying only a small stock and considerably less sales expense, so he, too, in turn, will be protected against the consumer, who carries none of these burdens, and who, consequently, must pay a profit to the contractor and to the jobber.

"It is our idea that 'quality' and 'service' are the two things which the owner of the building is entitled to have. We will furnish the 'quality' and stand responsible for it, but it is up to the jobber and the contractor to furnish the 'service.'

"We are not the least afraid that we are not going to succeed in our policy, because we have already attained success, even though our policy is not as yet fully worked out in all of its details. We do believe, however, that we should receive co-operation, and thorough co-operation, from the jobbers. We do not want the jobbers to go around and say that they handle two kinds of wire, one 'quality' and one 'cheap.'

"We do not think that any jobber should handle anything but good wire, and this does not mean either that we expect all of the electrical supply jobbers in the country to sell nothing but our material. We do feel, however, that no jobber should sell or buy any wire because it is cheap. He is neglecting his obligations to the public when he adopts this attitude.

"If he is now handling what is known as 'cheap' wire, he should immediately investigate the supplier's methods, both manufacturing and selling, and make absolutely certain that nothing is neglected in inspections, and satisfy himself that the material is up to the proper standard.

### STANDARD POLICY FOR MANUFACTURERS

"We cannot emphasize too strongly to the jobber the importance of driving every manufacturer to adopting a standard policy of recognizing the jobbers. This is the only sane policy in the electrical business, and if a manufacturer is not intelligent enough to adopt such a policy, then his selling methods are open to criticism, and when any of his methods are open to question his manufacturing methods are also under fire.

"The jobber must accurately examine his cost of operation and sell no wire except at a profit. He must insist on buying and selling a 'quality' article only. He must deal on prices based on the market, wherever possible, and he must adopt a policy and stick to it. Don't let a salesman who has been unable to sell a standard article come along and show his ability by talking you into using a cheap article which is sub-standard. Convince yourselves that what you are doing is absolutely right, and convince your salesmen, and they will get you the orders, but make your policy and stick to it through thick and thin. A policy is not much good if it does not sometimes take a little courage to carry it out."

### RIGID CONDUIT

The supply of rigid iron conduit is now quite limited, and the market conditions were ably analyzed by C. E. Corrigan. Twelve years ago, he said, there were only four manufacturers of rigid iron conduit in the country, and their total output ranged from 25,000 tons to 30,000 tons annually, while eleven manufacturers are now engaged in the business and the consumption has increased to 100,000 tons annually. Of course the production of conduit and its price vary in a measure with the iron and steel market. The merchant pipe production of the country, which includes conduit, boiler tubes and oil-country products, amounts to 2,750,000 tons annually, and conduit represents about 4 per cent of the pipe production of the United States.

Mr. Corrigan explained the condition of over-production which obtained in 1913 and its effect on the rigid conduit market. As a result of the conditions which then prevailed, the Pittsburgh basing discount plan was adopted, which recognized Pittsburgh as the center of application of terms so that all rigid conduit was thereafter sold f.o.b. Pittsburgh and must be quoted and billed at discounts delivered at destination. In this way the vexing problem of freight charges was eliminated as a disturbing factor.

Mr. Corrigan then outlined the growth of certain business practices and showed the evils of protection contracts covering specific jobs. In October last year all protection contracts were eliminated by the rigid conduit manufacturers. Under present conditions the manufacturers generally sell to authorized distributers and they in turn supply all other classes of trade. The speaker advised jobbers to qualify for the situation in every way possible by stocking the material in carloads and educating all other classes to purchase from them rather than from the manufacturers.

As an index of present and recent conditions Mr. Corrigan quoted comparative average prices on conduit for carload Pittsburgh basing discounts without preferentials, ½-in. size:

| | Galvanized | Enameled |
|---|---|---|
| July to Dec. 31, 1915 | 76.70 | 64.70 |
| Jan. 1 to June 30, 1916 | 92.00 | 83.38 |
| July 1 to Dec. 31, 1916 | 105.20 | 92.20 |
| Jan. 1 to April 30, 1917 | 127.98 | 115.98 |
| Price current May 10 | 170.00 | 158.00 |

The discounts range from 61.65 to 15 per cent in the case of galvanized conduit and from 67.65 to 21 per cent in the case of enameled conduit. Conditions in the iron and steel market are such that at present many manufacturers of rigid conduit have withdrawn from the market and are caring for the wants of only their regular customers. Steel mills can make more money making other products at present, and the shortage of pig iron presages that conditions will become worse instead of better in the immediate future.

The demand for conduit no longer comes from investment building operations such as office buildings and the like, but from factory, state and government buildings, and especially from shipbuilding companies, whose demand for some time to come will be brisk. The steel business will continue to capacity, in Mr. Corrigan's opinion, long after the war has ceased, and that, in addition to the scarcity of raw material and labor, will lead to still higher prices.

The opinion of many in attendance is that there will shortly be no rigid conduit market at all, every sale being the subject of individual negotiation.

### WORK OF SOCIETY FOR ELECTRICAL DEVELOPMENT

Mr. Wakeman outlined briefly the work of the Society for Electrical Development in its various campaigns and the service the society was prepared to render the jobber. It was decided, he said, to change the date of the usual electrical week from December to spring and to conduct the wiring campaign in the fall instead of in the spring as heretofore.

## NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION TO MEET

### President Osborn and Prominent Members Feel It a Duty to Hold Convention—"Business Going On as Usual"

President M. C. Osborn of the Northwest Electric Light and Power Association announces that the annual meeting will be held in Spokane, Wash., on Sept. 12 to 15, as planned. Mr. Osborn speaks of the action of the National Electric Light Association and other organizations in abandoning their conventions and adds:

"Some apprehension has been felt by certain of the membership as to whether or not our convention would be held as usual. This matter has been taken up with the prominent members of the association, and it is felt that it is the duty of the president of the association to bring the convention to a successful conclusion, thereby expressing our confidence in the stability of our national government, and therefore it will be necessary for all of the members to bend their energies and assert their aggressiveness to a greater degree than ever in order to accomplish this.

"It is my belief that in no way can we better show patriotism than by displaying the same spirit that we, as citizens of the United States, displayed in our declaration for national liberty, in making this, our first war convention, greater than all those preceding it. Let us have our business going on as usual."

The program committee feels the importance of continuing, year after year, a paper or bulletin entitled "Experiences and Wrinkles." This will be compiled this year by Lewis A. Lewis, Washington Water Power Company, Spokane. A "wrinkle" is defined as "any device, short-cut method or experience which has been worked out and used to advantage in carrying on your business." President Osborn urges members to send Mr. Lewis any experiences or wrinkles which they may have gathered.

The present program is as follows:

*Wednesday, Sept.* 12, 10 *a. m.*—Address of welcome, Mayor of Spokane; response, D. L. Huntington, president Washington Water Power Company; committee reports; president's address; paper by J. C. Ralston, member American Society of Civil Engineers, "Aphorisms."

*Wednesday, Sept.* 12, 2 *p. m.*—Paper, "Practical Central Station Salesmanship." Editor-chairman, Lewis A. McArthur, Pacific Power & Light Company; George Bowen, Northwestern Electric Company; S. A. Hoag, Puget Sound Traction, Light & Power Company; H. W. Lines, Portland Railway, Light & Power Company; Lewis A. Lewis, Washington Water Power Company; C. R. Young, Pacific Power & Light Company.

*Thursday, Sept.* 13, 10 *a. m.*—Paper, "How the Engineer Can Assist the Commercial Department." Editor-chairman, D. F. Henderson, Washington Water Power Company; Gilbert L. Duffy, Puget Sound Traction, Light & Power Company; J. C. Henkle, Portland Railway, Light & Power Company; A. S. Hall, Pacific Power & Light Company; L. T. Merwin, Northwestern Electric Company.

*Thursday, Sept.* 13, 2 *p. m.*—Paper, "Co-operation in Modern Home and Apartment House Wiring Practice." Editor-chairman, A. C. McMicken, Portland Railway, Light & Power Company; H. H. Schoolfield, Pacific Power & Light Company; L. R. Grant, Puget Sound Traction, Light & Power Company; F. O. Broili, Northwestern Electric Company; Foster Russell, Washington Water Power Company.

*Thursday, Sept.* 13, 8 *p. m.*—Illustrated lecture, "Commercial and Residential Illumination," F. D. Fagan, manager General Electric lamp department on Pacific Coast.

*Friday, Sept.* 14, *Both Sessions,* 10 *a. m. to* 12 *m., and* 2 *p. m. to* 5 *p. m.*—Range committee report, W. R. Putnam, Utah Power & Light Company, chairman.

In connection with this report a paper will be read by H. B. Peirce, Washington Water Power Company, on "Busbar Diversity of Ranges," and one by B. L. Steele, professor of physics, Washington State College, Pullman, Wash., giving results of certain tests.

*Friday, Sept.* 14, 7:30 *p. m.*—The usual banquet will be held in the Elizabethan room, Davenport's. Informal.

For Saturday, Sept. 15, all-day arrangements have been made to visit the mine and smelter of the Bunker Hill & Sullivan Mining & Concentrating Company at Kellogg, Idaho.

The Washington Association of Electrical Contractors and Dealers will hold its first session on Thursday, Sept. 13, instead of Wednesday, Sept. 12, as previously announced.

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## ELECTRIC POWER CLUB ANNUAL MEETING PLANS

### Sessions in Washington, June 11 and 12—Howard E. Coffin, C. E. Patterson, Costs and War Matters on Program

A change has been made in the plan for the annual meeting of the Electric Power Club. The meeting will be held at the New Willard Hotel, Washington, D. C., on June 11 and 12.

The first day will be devoted to reports of officers and committees, including standardization work, etc.

On the second day Howard E. Coffin will make an address on general manufacturing problems in connection with the national emergency. C. E. Patterson, comptroller General Electric Company, will present a paper on "Uniform Cost Accounting." This will be followed by general discussion and perhaps a short talk by a representative of the Federal Trade Commission.

A member of the club will present a paper analyzing manufacturing conditions during the last two years and showing the cause of increased costs. Government departments may also present some matters.

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## CO-ORDINATION OF UTILITIES IN GREATER NEW YORK

### Plans for Effective Mobilization in the National Interest Being Worked Out with Public Service Commission

Carrying out the plan to mobilize through effective co-operation the public utilities of Greater New York, a committee was appointed at a meeting called by the Public Service Commission, First District, on May 17.

John W. Lieb, New York Edison Company, and representatives of gas and electric railway companies were appointed on an executive committee. Sub-committees:

Co-ordination of utility services—George Keegan, chairman; materials and supplies—W. R. Addicks; relation of the utility companies and their employees to the public service and to the national government—J. W. Lieb; relations with the authorities and the protection of plant and property—Travis H. Whitney, Public Service Commission.

ILLUMINATION OF THE JOAN OF ARC AND PULITZER STATUES IN NEW YORK

## ELECTRIC LIGHTING TRIBUTE TO FOREIGN WAR COMMISSIONS

### Effective Illumination in New York City During Visit of British and French Delegations Described by Clarence L. Law

Describing the effective lighting in New York City during the visit of the British and French war commissioners recently, Clarence L. Law, New York Edison Company, secretary of the Mayor's committee on illumination, states to the ELECTRICAL WORLD:

"The 'Golden Way' on Fifth Avenue extended from Twenty-fifth Street north to Eighty-fourth Street. In this district 528 lamps and globes were changed, increasing the candlepower from 400 to 750.

"The special lighting of the City Hall was produced by using two floodlighting lamps of 500 cp. each with the four flags on the roof. Light from a battery of twenty-five lamps of 500 cp. each was thrown on the façade of the center of the building.

"Both sides of the Washington Arch were lighted by batteries of flood lamps, there being twelve on each side.

"The shafts on the north side of Madison Square were each lighted by batteries of six 300-cp. units in projectors, making a very striking appearance.

"The Lafayette statue and the background especially built were illuminated by six floodlighting lamps in banks of three, diffusing the light.

"On the Waldorf-Astoria building a large electric sign in colors reproduced the badge of the Mayor's committee. This sign was erected in eight hours.

"The Public Library at Forty-second Street was lighted by a system specially designed to accentuate the particular features of the façade.

"At the Pulitzer monument the special illumination consisted of batteries of 500-cp. lamps in projectors installed in cypress trees in housings covered with greens to imitate vines.

"The Soldiers and Sailors' Monument was lighted in the same manner by projectors and 500-watt lamps.

"The Joan of Arc statue and its background were illuminated by a battery of twelve projectors equipped with lamps set across the drive, obscured partially by trees along the driveway.

"In all 112 projectors were used to light the different points, and it is estimated that the amount of light produced was equal to 5,000,000 candles."

## SECTION MEETINGS OF THE ASSOCIATED MANUFACTURERS

### Chairmen of the Sections to Meet with Board of Governors at Round-Table Dinner in New York on June 5

Chairmen of the various sections of the Associated Manufacturers of Electrical Supplies have been invited by the board of governors to attend a round-table dinner at Delmonico's, New York, on the evening of June 5. One of the subjects of discussion will be the relations of the sections to the national government in view of the needs arising from the war. C. E. Patterson, comptroller General Electric Company and chairman of the committee on the standardization of accounting and costs, will make a talk on the new accounting system.

Meetings of various sections have been called as follows:

June 5, 2 p. m.—Lighting fixture section.

June 6, 10 a. m.—Line material section and snap switch section.

June 6, 2 p. m.—Molded or formed insulation section, lamp receptacle and socket section and knife switch section.

June 7, 10 a. m.—Fan motor section and fuse section.

June 7, 2 p. m.—Panelboard and switchboard section and porcelain section.

June 7, 4 p. m.—Attachment plug section.

June 22, 10.30 a. m.—Outlet box section.

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## MANUFACTURERS' CLUB MEETING IN NEW YORK

### Gathering Replaces the Usual Spring Meeting at Hot Springs, Va.—Resolutions Offer Co-operation with Council of National Defense

A meeting of the Electrical Manufacturers' Club was held at Delmonico's, New York, on May 17. It replaced the May meeting usually held at Hot Springs, Va.

Resolutions were passed offering the co-operation of the club with the Council of National Defense. Aside from this action only business of a routine character was transacted.

Dr. Talcott Williams made an address on international relations.

# INJUSTICE OF FIXED RATES WHILE COSTS KEEP RISING

## Missouri Association of Public Utilities, on Annual Convention Trip, Shows Immediate Need of Action—Committee on Rates and Fuel

The eleventh annual convention of the Missouri Association of Public Utilities was held on board the steamer Quincy on the Mississippi River between St. Louis and Cape Girardeau from May 17 to 19. Association members, their families and friends to the number of about 180 were on board. In his presidential address Hugo Wurdack, St. Louis, pointed out the absolute necessity of most efficient operation of all public utilities at this crucial time.

### INJUSTICE OF FIXED RATES

John A. Porter, vice-president Light & Development Company of St. Louis, read a paper on "Variable Versus Fixed Rates," drawing attention to the injustice done to both the public and the utility by the continuance of fixed rates in the face of increasing prices of all commodities which go into the utilities' products. Mr. Porter presented data from ten plants to show how costs have advanced.

The spirited discussion which followed indicated an immediate need for action on the part of utilities and the Missouri commission to increase rates. It seems to be the prevailing impression that the increase can be had most expeditiously by increasing the price to large power customers without disturbing residential rates.

Dr. Shaw, a former member of the Public Service Commission, said: "I doubt very much if the proposition for variable rates upon the cost of commodities could be introduced without long discussion and more education upon the part of the commission than has already been given. I think it is more a question of emergency relief on account of existing conditions. I believe that if the matter is presented to the commissioners in the right light they will not see how they can avoid it, and if they do avoid it the courts will have something to say."

In the absence of C. S. Ruffner, vice-president Union Electric Light & Power Company, St. Louis, L. H. Egan read an editorial from the ELECTRICAL WORLD of May 12, "Opportunities for Service Developed by the War," and abstracts from the report of the National Electric Light Association war convention.

The Friday afternoon session was opened by a paper on "The Relation of the Public to Public Utilities," by Dr. Shaw, formerly of the Public Service Commission.

"The Group Block Rate," a paper by J. E. McLeod, Laclede Gas Light Company, St. Louis, explained that company's rate system.

E. D. Bell, general superintendent St. Louis Electric Terminal Railway Company, presented a paper on "Interurbans as State Developers."

### COMMITTEE ON RATES AND FUEL

At the final business session, Saturday morning, a committee was appointed to investigate the rate and fuel situation, and to prepare a report to be presented before the State Public Utilities Commission. It is expected that the efforts of this committee will operate to relieve immediately the difficult situation of the smaller companies.

The following were elected for the ensuing year: President, Bruce Cameron, United Railways, St. Louis; first vice-president, J. H. Van Brunt, St. Joseph (Mo.) Railway, Light, Heat & Power Company; second vice-president, J. N. Scott, Kansas City Gas Company; third vice-president, L. P. Andrews, City Water Company, Sedalia; secretary and treasurer, F. D. Beardslee, Union Electric Light & Power Company, St. Louis; executive committee, J. E. McLeod, Laclede Gas Light Company, St. Louis; L. H. Egan, Union Electric Light & Power Company, St. Louis; committee on public affairs, I. R. Kelso, St. Louis; E. D. Bell, St. Louis; J. R. Woodfill, Aurora, and C. L. Proctor, Joplin.

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# MEN WANTED FOR SIGNAL ENLISTED RESERVE CORPS

## Several Thousand Trained Workers Are Needed for Field Signal Battalions of New National Army

The Signal Enlisted Reserve Corps of the United States Army needs several thousand trained electrical men, particularly those experienced in telegraph, telephone and radio work, including operators, construction men, wire men, maintenance men and electricians. This presents an exceptional chance for instructive employment in the service of the country. Ten field battalions are being organized in the Eastern Department of the army, and it is expected that they will be mobilized in the near future.

The Signal Enlisted Reserve Corps will be a part of the new national army, and comprises both field and telegraph battalions, the former serving with the various divisional headquarters in the field and the latter maintaining communication with interior bases.

This necessary branch of the service maintains the lines of communication between the commanding general of the division and his cavalry, artillery and infantry brigades, as well as with regimental and battalion headquarters. In their electrical work the signal corps field battalions maintain telegraph, telephone and radio communication, while in visual signaling they use wig-wag and semaphore flags and heliograph in the daytime, and at night flashlight and lantern.

In signaling, parties of three or four men are often employed, and there are, therefore, a large proportion of non-commissioned grades such as sergeants, corporals, etc., so that there is a good chance of promotion.

The Enlisted Reserve Corps is composed of men from eighteen to forty-five years of age and is subject to only fifteen days' annual service in peace, while in wartime it may be called at the discretion of the President. Pay corresponds to that of the regular army, and uniforms are furnished as well as transportation to place of mobilization.

Enlistment may be made by applying to signal officers of the various departments of the army, as follows:

Eastern Department, Army Building, 39 Whitehall Street, New York.

Central Department, Federal Building, Chicago.

Northeastern Department, Nottingham Chambers, Boston.

Southeastern Department, People's Bank Building, Charleston, S. C.

Southern Department, Fort Sam Houston, San Antonio, Tex.

Western Department, San Francisco.

## COMMISSION VALUATION OF POTOMAC POWER COMPANY

### Finding of Regulating Body Places Figure of $11,231,170 Upon Property of Company in District of Columbia

Announcement of the results of valuation of the Potomac Electric Power Company has been made by the Public Utilities Commission of the District of Columbia. In its conclusion the commission says:

"After full consideration of all the evidence in this case the commission finds the fair value of the property of the company used and useful for the convenience of the public within the District, as of July 1, 1914, to be $10,250,000. It finds the net addition to investment from July 1, 1914, to Dec. 31, 1916, inclusive, to be $981,170, and therefore further finds the fair value of the property used and useful for the convenience of the public within the District as of Dec. 31, 1916, to be $11,231,170. In reaching conclusions the commission has, as to every element of value, considered the company as a going concern in successful operation."

## INCREASE IN POWER RATES BY THE PITTSFIELD COMPANY

### Schedule Will Be Decreased or Increased 1¼ Mills per Dollar Decrease or Increase in Coal—Steam Heat Rates Also Up

Increases in power and steam heating rates are announced by the Pittsfield (Mass.) Electric Company as a direct result of higher coal cost. The advance in power rates takes effect on June 1 and that in heating rates on Sept. 1. The notice to power customers states:

"Coal cost $3.75 on the cars in Pittsfield when our present power schedule was adopted. To-day the cost of coal is $6.15, an increase of $2.40 a ton.

NEW POWER SCHEDULE OF PITTSFIELD COMPANY

| Amount Used per Month Kw.-Hr. | Rate, Cents | Amount Used per Month Kw.-Hr. | Rate, Cents |
|---|---|---|---|
| 0 to 100 | 6 | 5,000 to 10,000 | 2.5 |
| 100 to 200 | 5 | 10,000 to 15,000 | 2.25 |
| 200 to 300 | 4.5 | 15,000 to 45,000 | 2 |
| 300 to 400 | 4 | 45,000 to 75,000 | 1.8 |
| 400 to 800 | 3.5 | 75,000 to 100,000 | 1.7 |
| 800 to 1,500 | 3.25 | 100,000 to 150,000 | 1.6 |
| 1,500 to 3,000 | 3 | 150,000 and over | 1.5 |
| 3,000 to 5,000 | 2.75 | | |

Five per cent discount on above rates for payment of bills on or before the fifteenth of the month in which they are rendered.

This schedule is subject to change depending on the decrease or increase in the cost of coal.

Minimum charge for connection, 75 cents per month, plus 25 cents per connected horsepower or fraction.

RENTAL CHARGE FOR MOTORS BELONGING TO THE COMPANY, IN ADDITION TO ABOVE SCHEDULE

| Size | Rent per Month | Size | Rent per Month |
|---|---|---|---|
| ½ | $2.00 | 7½ | $7.50 |
| ¾ | 2.25 | 10 | 10.00 |
| 1 | 2.50 | 15 | 12.00 |
| 2 | 3.00 | 20 | 15.00 |
| 3 | 4.00 | 25 | 17.00 |
| 5 | 5.00 | 35 | 25.00 |

"For each $1 increase in the cost of coal the cost of producing electric power has risen 1¼ mills per kw.-hr.

"The directors of this company now find it necessary to increase the rates for electric power by the increase in cost of coal and announce a new schedule to take effect June 1, 1917.

"This schedule will be decreased or increased at the rate of 1¼ mills per dollar decrease or increase in the cost of coal. We hope the high price of coal is only temporary and that we will be able to restore the former schedule in the near future."

## PORTLAND COMPANY VALUATION BY THE OREGON COMMISSION

### Decision of Regulating Body That Value Is $55,307,474, of Which $19,492,153 Is Electric Utility Operating Property

A valuation of the property of the Portland Railway, Light & Power Company has been completed by the Oregon Public Service Commission. It says:

"Based upon a consideration of these elements, in the light of the entire record before it, and making due allowance for development cost and working capital, the commission finds as fact that the value of the utility property of the company for rate-making purposes, as that value is hereinbefore defined, plus the value of the non-utility property determined on the same basis, was on Dec. 31, 1916, $55,307,474. Of this amount $8,444,502 represents non-utility property, leaving a total valuation of the property used and useful in the service of the public of $46,862,972."

Of this value $19,492,153 represents electric utilities.

## LIGHTING PREPAREDNESS PARADE IN COLUMBIA, S. C.

### Outfit Mounted on an Automobile, with Wires Extended to Poles Carried by Scouts, Provides Illumination for Band and Flag

J. F. Knowlen, general superintendent Columbia (S. C.) Railway, Gas & Electric Company, calls attention to a unique method of lighting a preparedness parade and welcoming a "booster club" which was adopted recently in that city.

Mr. Perry of the Perry-Mann Electric Company of Columbia mounted a Delco lighting outfit on the rear of a Ford car and extended wires to poles bearing lamps which were carried in the parade by boy scouts. The energy provided light for the band and also illuminated a transparent flag.

## PURCHASE OF UTILITIES BY THE MILWAUKEE SYSTEM

### Company Acquires Property and Business of Commonwealth Power Company and Heating Business of Continental Realty Company

Early in July, 1916, the Milwaukee Electric Railway & Light Company was authorized by the Wisconsin Railroad Commission to purchase the Commonwealth Power Company property and plant. This followed the practical conclusion of negotiations between the parties looking to the sale to the Milwaukee company of the competing utility plant owned in large part by the principal stockholders of the Schlitz Brewing Company.

The Commonwealth company was organized in 1907 and built a plant and distributing system within a limited area in almost the exact center of Milwaukee, extending about one mile along the west bank of the Milwaukee River. For a number of years the principal load consisted of the power supplied to the Schlitz Brewing Company and to a few large buildings owned by the same interests in the business center. The company came under the provisions of the public utilities act and obtained an indeterminate permit upon surrender of its franchise. The Continental Realty Company owned and operated a heating distribution system, which was generally managed and operated as an auxiliary of the Commonwealth business.

The details, effecting actual transfer of the property pursuant to the authorization of the commission, were finally completed on April 9 of this year, and the Milwaukee company took possession of the property on that day.

The principal generating station of the Commonwealth company, on the west bank of the Milwaukee River immediately south of the Holton Street viaduct and near the north limit of the Commonwealth company's franchise district, has a rating of 6000 kw. It carried the principal load, but supplied no heating service. The company had a plant containing 1200 kw. in generating equipment in the Enterprise Building, Second and Sycamore Streets. The steam-heating mains radiating from this plant are already cut over to the extensive heating system of the Milwaukee company, and the Enterprise plant has been shut down. Electrical connections have been effected between the Milwaukee company's main Commerce Street station and the distributing system of the Commonwealth company, which permitted the closing down of the Holton Street plant. This station will be held in reserve by the Milwaukee company for peak-load service during winter months.

The equipment constituting the Enterprise plant is being removed and will be installed in the Milwaukee company's Oneida Street station for use in furnishing exhaust steam to the Milwaukee company heating system. Small substations operated by the Commonwealth company either have been discontinued or will be immediately, and the distributing system supplied from such substations is being cut over to the Milwaukee company's system. Owing to similarity in characteristics, the Milwaukee company took over the entire Commonwealth system with comparatively few changes.

The Commonwealth Power Company had a maximum load during the winter of 1916-1917 of 2500 kw. For the year ended June 30, 1916, the electric business of the Commonwealth Power Company amounted to $231,000 gross, of which about 40 per cent came from the Schlitz Brewing Company and allied interests. Consolidation will permit the business of both companies to be handled by one organization with considerable gain in economy.

## SAN FRANCISCO TO EXTEND NEW LIGHTING SYSTEM

### General Plan Harmonizes with Installation for the "Path of Gold"—Arrangements for Financing the Cost

Construction has been commenced on the installation of a lighting system in the triangular section of San Francisco bounded by Market, Powell, Sutter and Kearny Streets. The general plan harmonizes with the new lighting system installed recently on Market Street.

This plan provides for the illumination of approximately 8900 ft. of street and involves 15,000 front feet abutting property; 258 lamps are to be installed on 128 two-lamp standards. The lamps are to be 6.6-amp. luminous-arc type equipped with "San Francisco Gold Carrara" glassware as in the Market Street system.

It is the plan to operate 102 of the lamps all night, while the remainder will be turned out at midnight. The contract between the Pacific Gas & Electric Company and the Downtown Association provides that the merchants and property owners will contribute $16,177 per annum toward the system. On this basis the city is required to advance only $4,000 per year in addition to the present cost of lighting this district. In other words, the Pacific Gas & Electric Company has offered to install the system and operate it for five years at $27,652 per annum. At present the city pays $7,475 per annum for lighting this area.

The installation is to be carried out by the Pacific Gas & Electric Company, using equipment designed by W. D'A. Ryan and supplied by the General Electric Company. It will be in operation Oct. 1, 1917.

## PLAN FOR THOMSON MEDAL FUND ISSUED BY N. E. L. A. COMMITTEE

### Class B and E Members Asked to Contribute to Promote Studious Effort and Progress Among Younger Men

L. D. Gibbs, chairman, and Frank A. Birch, composing a committee of the National Electric Light Association to secure subscriptions to the Thomson scholarship fund, have written to Class B and E members suggesting that they take a voluntary part in the movement.

The fund is to be $5,000. It is proposed as a recognition of the eminently helpful work of Prof. Elihu Thomson. Suggested by Past-president E. R. Weeks, the plan adopted was worked out by a committee of which Charles L. Edgar was chairman and John F. Gilchrist, J. W. Lieb and Mr. Weeks members.

This medal is to be awarded "in any year to any citizen of the United States or Canada who at the time of the award shall not be over thirty-five years of age, and who, in the judgment of the trustees of the medal, shall have made a notable contribution to electrical science or its industrial applications through original investigation, research or discovery, or through whose direct efforts a substantial contribution to the advancement of the industry shall have been accomplished."

# Commission Rulings

**Important decisions of various state bodies involving or affecting electric light and power utilities.**

**Iowa Commissioners Rule on Danger Label.**—The Iowa Board of Railroad Commissioners has given a formal ruling construing the provisions of Sec. 2120-r, code supplement, with reference to the length and width of the letters of the "label." The section referred to provides: "At any crossing of any highway by said transmission line the poles or towers next to the highway shall be labeled 'Danger. —— Volts Electricity.'"

**Indiana Commission Orders Lower Rates in Terre Haute.**—The Public Service Commission of Indiana has rendered a decision in the case in which the Commercial Club of Terre Haute sought revision of electric rates in that city. The Terre Haute, Indianapolis & Eastern Traction Company supplies electric service. The commission valued the property "used and useful for the convenience of the public" at $900,000 and ordered a lower rate to take effect June 1, 1917. It allowed a return on the $900,000 valuation of 7 per cent, or $63,000 annually. In referring to cost of coal, the commission says: "Defendant now claims that there will be an increase of $40,000 for fuel. This will no doubt be true for the next year, but we assume that the figure will not be so high over a period of five years. No doubt a revision of rates will be made near the expiration of that period if the result of the rates now established does not show that a modification should be made in a shorter period."

**Testimony on Cleveland Valuation.**—The Ohio Public Utilities Commission heard testimony on May 15 in the appeal of the Cleveland Electric Illuminating Company from the Cleveland city ordinance fixing the lighting rate at 3 cents per kilowatt-hour. Fred Schauffler, Cleveland real estate dealer, testified regarding the valuation of property by a committee of the Cleveland Real Estate Board. Director of Law W. S. FitzGerald cross-examined him as to the factors considered in fixing the value of the land at $935,096. The value given by the commission engineers was $921,728. Robert Lindsay, vice-president and general manager of the company, told how the company arrived at the value of its properties. He contended that the commission should not make a deduction for depreciation. Attorney FitzGerald criticised the commission's allowance of $1,115,724 for cost of attaching business, $303,551 for working capital, $5,00,000 for overhead expenses, and the items allowed for preliminary and administration expenses. The commission's total valuation of the property is $20,820,062, while the company's comes to $22,478.342. F. W. Ballard, former Cleveland commissioner of light, has been employed, and he was given until July 10 to prepare a statement on intangible values.

**Consumers' Deposits in Illinois.**—In the matter of W. L. Cook (Lacon, Ill.) vs. Public Service Company of Northern Illinois, the Illinois Public Utilities Commission discusses cash consumers' deposits and passes upon the equities thereof. The petitioner had been asked to make a cash deposit of $20 to assure the prompt payment of his bills for electric service at a hotel in Lacon; the company refused to accept a guarantee of a local property owner in good credit standing, and the customer appealed to the commission. The commission says: "The situation is little different from that which heretofore has confronted the commission on several occasions. This commission (as well as other regulatory commissions) has recognized the necessity of requiring reasonable cash deposits to assure prompt payments of consumer's bills, provided such deposits be collected without unfair discrimination. Uncollectible bills, if possibly not allowable as an operating expense in a utilities account, at least represent an item (or deduction from revenue) which must be given adequate consideration in a rate case before the commission can determine upon the fair rate of return that a utility is entitled to receive. The dishonesty of a few, manifested by uncollectible bills upon a utility's books, must ultimately be distributed over the rates which are paid by the more conscientious users of public utility service. In protection to the general public, it becomes necessary to establish fair and reasonable guarantees to assure that utility service bills be paid with reasonable promptness and dispatch. Naturally, the respondent herein, in common with utilities generally, would prefer that the question of a requirement of a cash deposit in individual instances be left to the utility's judgment. To a certain extent there is some argument in support of this view, inasmuch as the field of state regulation at this point appears to approach and mingle with the inherent management which properly is to be left to the utility itself. It has been the experience of this commission, however, that consumers generally are more or less averse to the making of cash deposits unless the reasonableness thereof has been passed upon by the commission, and it has been the further experience that considerable unjust discrimination and unreasonableness will be practiced by utilities if left to administer consumers' deposits without proper restrictions. Surely it is not improper that this commission take jurisdiction over the regulations governing such deposits, and such jurisdiction is well within the wording and the intent of the public utilities commission law." The commission required the utility to file regulations governing the terms and conditions under which consumers' deposits are required, held, and withdrawn; and, until such rules had been filed and accepted, the utility was required to desist in its practice of requiring consumer deposits in Lacon.

# Recent Court Decisions

**Findings of higher courts in legal cases involving electric light, power and other public-utility companies.**

**Claim for Minimum Rate During Receivership After Power Was Cut Off Not Allowed.**—Where a contract for electric power service required the customer to pay a certain minimum rate for investment, whether energy was used or not, where the customer was placed in receivership, and the company immediately cut off the current without notice, its claim for the minimum rate during the receivership after the power was cut off cannot be allowed, it was held by the Supreme Court of North Carolina (925 E. 6).

**Regularity in Support Furnished Dependents.**—Under the workmen's compensation act authorizing an award for the death of an employee should he leave any widow, child, parent, grandparent or other lineal heir to whose support he had contributed within four years previous to the time of his injury, it is not necessary to show that there was any regularity in the support furnished or that those receiving contributions were dependent on the deceased employee, the Supreme Court of Illinois held in the case of Commonwealth Edison Company vs. Industrial Board of Illinois (115 N. E., 158).

**Use of Streets Under Legislative Grant.**—Under the law authorizing the construction of a telegraph or telephone line along public highways or across rivers or over any lands belonging to the State or to any private individual, and the erection of necessary fixtures, etc., and that such fixtures must not be so constructed as to incommode the public, and shall not be set up on private grounds without paying damages, no compensation need be paid to a city for the use of its streets for such fixtures, although the statute did not bargain away the police power of the state or a city or the power of the city under legislative authority to impose a license fee or tax, it was held by the Supreme Court of Iowa (162 N. W., 322). Under the legislative grant a telephone company had the unlimited right to use the public streets of a city for its poles, wires and apparatus, rent free, and this right continued until revoked by the State in the exercise of its reserved powers, since as the State has not only all the power delegated to a city, but complete and plenary powers over all matters which it may delegate, it was within the powers of the Legislature to make such grant. Where the fee title to streets and alleys is in a city, it is held by the city in trust for the general public, and not for itself and its inhabitants alone, and hence where permission or authority is granted by the Legislature itself, the city is not entitled to compensation.

## *Associations and Societies*

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

**Associated Employees of the New Orleans Railway & Light Company.**—At a recent meeting of the Associated Employees of the New Orleans Railway & Light Company E. N. Avegno was unanimously elected president for the coming year.

**New York Electrical Society.**—The 356th meeting of the New York Electrical Society was held in New York City on May 17. "Electric Travel in the Northwest and Mount Rainier National Park" was the topic of the evening, Gilbert McClurg being the speaker.

**American Chemical Society.** — The fifty-fourth meeting of the American Chemical Society was recently held in Kansas City, Mo. An interesting outline of hydroelectric developments in Canada was given by H. E. Howe, who acted as chairman of the industrial division.

**Institute of Radio Engineers.**—Professor Pupin was unable to present his presidential address before the Institute of Radio Engineers on May 16, as planned. He will present his paper on "Iron at Radio Frequencies" on June 6 at the Engineering Societies Building in New York City.

**Something New in Industrial Lighting.**—Ward Harrison, illuminating engineer of the National Lamp Works of the General Electric Company, Nela Park, Cleveland, addressed the Chicago Section of the Illuminating Engineering Society on May 18, his subject being "Something New in Industrial Lighting." This was the last meeting of the season.

**Society of Terminal Engineers.**—The first regular meeting of the recently organized Society of Terminal Engineers will be held in New York, in the United Engineering Societies Building, on May 29. Special papers on terminal engineering and mechanical freight and material handling will be read. Committees will be appointed and a program adopted for the future work of the society. The secretary is J. H. Leonard, 1133 Broadway, New York.

**Indiana Electric Light Association.**—The new-business committee of the Indiana Electric Light Association, of which O. M. Booher of Kokomo is chairman, is making arrangements for a live convention and get-together meeting at Fort Wayne, Ind., June 20. The following papers will be presented: "Increasing Load Factor on Existing Lines," by N. A. Perry of Indianapolis; "Organization of New-Business Departments," by Thomas Donohue, Lafayette, Ind.; "Sales Developments of Socket Appliances," by M. Milton Henoch, Pittsburgh, Pa.

**Association of Iron and Steel Electrical Engineers.**—The Philadelphia Section of the Association of Iron and Steel Electrical Engineers will hold a meeting in Philadelphia on June 2.

**National Electrical Contractors' Association.**—President Robley S. Stearns of the National Electrical Contractors' Association has announced that the next meeting of the executive committee will be held June 19 and 20, the place to be decided upon later.

**Electrical League of Cleveland.**—The Electrical League of Cleveland will hold its annual meeting on May 31. One of the chief purposes of this meeting will be to elect seven directors for two years. On May 17 J. E. Latta of the Underwriters' Laboratories of Chicago addressed the league on the subject of "New Tendencies in Safety Work."

**Research as a Profession.**—The Worcester Polytechnic Institute branch of the A. I. E. E. held a meeting on May 18 at which Dr. P. G. Nutting, director of the new research laboratory of the Westinghouse Electric & Manufacturing Company, spoke on the subject "Research as a Profession." Dr. Nutting was formerly with the Bureau of Standards at Washington and with the Eastman Kodak Company, as assistant director of its research department.

**Association of Iron and Steel Electrical Engineers.**—"Power Cost Accounting Systems as Practiced by Several Steel Mills in the Pittsburgh Section" is the title of a paper to be presented by W. O. Oschmann, chairman of the power committee, at the regular monthly meeting of the Association of Iron and Steel Electrical Engineers, held at Pittsburgh to-day. The safety committee will also meet. The papers to be presented at the eleventh annual convention in Philadelphia by the safety committee will be under discussion. At the June meeting of the Pittsburgh Section James Farrington will present a paper on "By-Product Coke Ovens in the Steel Industry." The Cleveland Section of this association will hold a meeting in October to form a permanent organization out of the Cleveland body.

**Empire State Gas and Electric Association.**—The Empire State Gas and Electric Association held its mid-year meeting on May 17 at Syracuse, N. Y. The first subject for consideration at this meeting was "Work on Consumers' Premises," which was introduced by J. P. MacSweeney of the Rochester Railway & Light Company. A paper was presented by W. M. Halsey of the Public Service Gas Company of New Jersey, on "Merchandising," and another by Thomas R. Elcock, Jr., of the United Gas Improvement Company, Philadelphia, on "Advertising." Robert W. Hoy of the Elmira Water, Light & Railroad Company read a paper on "Residence Lighting with Particular Reference to House-Wiring Campaigns." C. H. B. Chapin, secretary, and H. C. Deffenbaugh, assistant secretary of the association, introduced the subject of "Service Charge," by which was meant the service charge portion of a rate and not a charge for service connection.

## *Current News and Notes*

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

**Municipalities Empowered to Operate Utilities.** — Governor Brumbaugh of Pennsylvania has signed a bill authorizing municipalities to lease and operate light, heat and power plants and systems and other public utility properties.

**Co-operative Campaign of Pacific Gas & Electric Company.**—The following supplements the statement of S. V. Walton, manager commercial department Pacific Gas & Electric Company, at the convention of the Pacific Coast Section, National Electric Light Association, as reported in the ELECTRICAL WORLD of April 28, 1917, page 815: Mr. Walton's statement at the Riverside convention with reference to the number and capacity of appliances put out in the co-operative campaign last year was to the effect that approximately 45,000 pieces, having a total rating of approximately 27,000 kw., were sold by the various jobbers participating in the campaign. The majority of these sales were made in the territory of the Pacific Gas & Electric Company, although, of course, a certain number were on lines other than those of that company, as the territory served by the jobbers is more extended than that served by the Pacific Gas & Electric Company.

**Military Census of New York City Factories and Mercantile Establishments.**—New York State proposes to take a census and inventory of the military resources of the State under laws passed this year and the State military law. A director of the census has been appointed for each county and one for New York City. E. P. Goodrich, member of the American Society of Civil Engineers, has been given the latter post. A preliminary enumeration has shown that in Greater New York there are about 3200 factories and mercantile establishments, in which are employed 400,000 persons. It was believed that this large group of persons could be readily segregated and returns secured from them in their places of employment. Director Goodrich has asked Alfred D. Flinn, member of the American Society of Civil Engineers, to organize a volunteer force among engineers of the various branches of the profession in New York City to take this part of the census. It is estimated that 400 or more engineer canvassers will be needed, each giving two full days or more of his time. Letters giving further information and forwarding pledge cards will be sent to the engineers of New York City in the near future. If any of the ELECTRICAL WORLD readers are able to help, and do not receive such an invitation, they may communicate with Director Goodrich or Mr. Flinn at room 904, 261 Broadway.

# *Men of the Industry*

Changes in Personnel and Position—Biographical Notes

A. S. M'ALLISTER

**A. S. McAllister,** consulting electrical and illuminating engineer, and former editor of the ELECTRICAL WORLD, is one of the three vice-presidents elected at the annual meeting of the American Institute of Electrical Engineers last week. Dr. McAllister was born Feb. 24, 1875, at Covington, Va., where he received his early education. Upon graduation from Pennsylvania State College in 1898 he worked at mines near Windber, Pa., during that year and the next, where he gained experience in electric locomotive operation. In the following year he went to the Westinghouse works at East Pittsburgh, Pa., where he studied practical manufacturing details of direct-current and alternating-current machinery. In 1901 he completed a post-graduate course in electrical engineering at Cornell University, and in 1905 he received the degree of Ph.D. From 1901 to 1904 he was instructor in physics and applied electricity at Cornell, being appointed in 1904 to an assistant professorship in electrical engineering. The following year Dr. McAllister joined the staff of the ELECTRICAL WORLD as associate editor, becoming editor of the paper in 1913. In 1915 he resigned to take up engineering work as consulting engineer. Dr. McAllister is particularly well known for his pioneer work in illuminating engineering and in the design of alternating-current motors. He has contributed largely to contemporary engineering literature both in the form of original articles and in textbooks which are widely used. Dr. McAllister is a fellow of the Institute and a past-president of the Illuminating Engineering Society, besides being affiliated with many other technical associations of national scope.

**H. B. Joyce,** who was formerly power engineer of the United Electric Light & Power Company, has severed his recent connection with the Roth Wind Power & Ventilator Company to return to the United company, where he resumes the direction of the activities of its power bureau. Mr. Joyce received his engineering degree from Cornell University, and was foreman of the test department of the New York Edison Company for five years. During his previous connection with the United company, a number of very large power contracts were secured through him with companies engaged in refrigeration, metal refining and manufacturing industries.

**S. J. Dill,** vice-president of the United Gas & Electric Engineering Corporation, who was temporarily placed in charge of the operation of the company's Northern properties, succeeding George B. Tripp, will devote his time to the oil interests of the corporation, having recently been elected president of the Utilities Oil & Refining Corporation, which owns a large producing oil property in southern Kansas.

**Bruce Cameron,** superintendent of transportation of the United Railways, St. Louis, was elected president of the Missouri Association of Public Utilities at its 1917 annual convention last week. Mr. Cameron was born in Nevada, Mo., in 1877. He became connected with the United Railways in 1901, and in 1906 he was appointed superintendent of transportation, which position he still holds. In addition to his operating work, he has been active in the welfare work of the company.

**Frederick Bedell,** professor of applied electricity, Cornell University, was elected one of the vice-presidents of the American Institute of Electrical Engineers at the annual meeting last week. Professor Bedell, who is widely known as a writer of textbooks for electrical engineering students, has made very valuable contributions to the art in his research studies of alternating-current phenomena, especially as affected by wave form. Born in Brooklyn, April 12, 1868, his family moved to Montclair, N. J., four years later, where he received his early education. In 1890 he was graduated from Yale University, later pursuing graduate studies in science and engineering at Cornell University, where he was a fellow in electrical engineering from 1891 to 1892. During the following year he was an instructor in physics at Cornell, and from 1893 to 1904 was assistant professor of physics. In 1904 he was appointed professor of applied electricity, which chair he now holds. He was one of the three editors of the *Physical Review* from its foundation in 1893 through 1912, during which period the *Review* was controlled by Cornell University, and in 1913 was appointed its managing editor when the American Physical Society accepted its control. Professor Bedell had been very active in engineering and scientific association work and is a fellow of the American Association for the Advancement of Science. In 1914 he was elected a manager of the A. I. E. E. for a period of three years, and has served on a number of committees of the Institute, including the library committee, standards committee and international electrotechnical committee. He was a member of the International Electrical Congress held in Chicago in 1893, and the following year in St. Louis, and also was a member of the Jury of Awards of the Department of Electricity of the Louisiana Purchase Exposition in 1904. Professor Bedell is the inventor and patentee of various improvements in telegraphy, telephony and power transmission, including a system for the joint transmission of direct and alternating currents.

FREDERICK BEDELL

**H. C. Cummins,** formerly assistant general manager of the Northern States Power Company, has been transferred to the Chicago office of H. M. Byllesby & Company.

**B. O. Lund,** superintendent of the Northern States Power Company, Stillwater division, has been appointed successor to A. S. Cummins as manager of the district.

**A. S. Cummins,** formerly manager of the Northern States Power Company, Stillwater division, has been transferred to the New York office of H. M. Byllesby & Company.

**T. D. Crocker,** assistant general manager of the Minneapolis General Electric Company, has been appointed assistant general manager of the Northern States Power Company, to succeed H. C. Cummins, who has been transferred to Chicago. Mr. Crocker was graduated from the school of electrical engineering of the Ohio State University with the class of 1904, going with the Milwaukee (Wis.) Electric Railway & Light Company upon completion of his course. He rose during his eight years with that company through several positions in the operating departments to be general superintendent of the central heating department and later commercial engineer for the company. In 1912 he became commercial engineer for the Consumers' Power Company at St. Paul, Minn., and later was transferred to Minneapolis, becoming assistant general manager of the local company, which position he has held until his recent promotion. In 1915 he was elected president of the Minnesota Electrical Association.

# REVIEW OF TRADE AND MARKET CONDITIONS

*News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods*

## HIGHER PRICES FOR LIGHTING GLASSWARE ARE EXPECTED

### Factories Faced with Possibility of Government's Taking Over 50 Per Cent of Output of Chemical Companies

Considerable uncertainty prevails at present in the lighting fixture glassware trade. A statement has gone out that the government will draw on chemical companies for 50 per cent of their output, and as this includes soda ash and sulphate of soda, besides other chemicals necessary to the production of glass, the factories are faced with a serious problem. Factories are having great trouble this year in securing a sufficient amount of these chemicals to keep going, therefore a curtailment of 50 per cent is naturally causing no small concern to producers.

Ordinarily glass furnaces close down at the end of June for the hot weather, when repairs and alterations are made. This year there is a possibility that the customary shutdown may as far as possible be dispensed with, or at least shortened in duration. No definite step has been taken on the matter, however.

That prices on lighting glassware will be higher in the near future seems practically certain. Just when the higher prices will go into effect and how great the advance will be it is not possible to foresee at this time, but it is known that manufacturers are working on new schedules and have advised branch offices to expect them.

Owing to the uncertainty regarding the possibility of maintaining production and because the increased value will warrant it the trade is being urged from different directions to secure its stock of glassware before it may be too late. A perceptible falling off in the demand for lighting glassware, particularly certain kinds, has been noticed. The entrance of this country into the war, it is felt, has been the cause.

## TURBINE PRODUCTION SOLD OUT FAR AHEAD

### Central Stations Anticipate Necessity for Increased Generating Facilities—Demand for Units of Larger Size Noticed

Each week sees the productive facilities for steam turbines booked further and further ahead. Capacity for the present year is sold out, and with the exception of some of the smaller sizes production for 1918 has been contracted for. In the very large sizes one manufacturer has but little left of 1919 production, and is now even booking orders for 1920 delivery. Only last week the largest single order on record, 200,000 kw., was placed. This order, which contains a number of 35,000-kw. units, will not be ready for delivery until probably well into 1918 or 1919.

Last year the demand for steam turbines eclipsed all previous records, but it seems evident that the business in 1917 will establish a much higher record. Already in certain districts the present year's business has gone ahead of the entire business done in 1916.

Realizing the sold-up condition of the market and anticipating the need that will be felt before long, a well-defined tendency has been noticed on the part of central stations to place orders for distant deliveries. As a result of the fuel situation central stations have this year taken on a very large power load, and this load is continually being added to. Consequently many stations are fast approaching their limit in generating facilities. In fact, there are some that have already reached this condition and are not in a position to take on further loads until additional equipment is received.

All through the market the tendency is particularly marked to purchase larger sizes than formerly. Quite a few orders have been received lately for 35,000-kw. units. But a few years ago a 200,000-kw. unit was hailed as very remarkable in size. Not only are turbines increasing in size, but they are working under higher steam pressures. These conditions have been stimulated by the present rapid rise in operating costs. The larger units, with higher steam pressures, give greater economies of operation.

Additions to factory space will permit of a much larger output of turbines this year than last, and it is owing to this increased factory space that the market is not sold farther ahead than it is. The manufacturers are doing everything in their power to increase and stimulate production, but the excessive demands have been greater than manufacturing facilities.

Not only has the central station business been large, but the demand for smaller units has kept up. These units, of course, can be supplied much quicker than the larger ones.

Prices have advanced somewhat, owing to the increased costs of manufacture. Castings and shapes are still advancing, and tend to swell the cost to produce turbines.

## MANY CONCERNS MOVING INTO LARGER OFFICES

### Increased Volume of Business Causing Trade Rapidly to Outgrow Present Quarters—Activity Not Confined to Large Concerns

Since the beginning of the year there has been a perceptible movement in the electrical trade toward larger office quarters. This is but one indication of the rapid growth of the electrical business, but it serves rather as evidence on the part of some manufacturers that the present volume of business is not expected to be greatly lessened. This activity is not confined to any single group, but, it has been noticed, applies to all lines and to the very large as well as to the very small concerns. More space has become necessary, and numbers of district offices are weekly seeking larger quarters. This is owing entirely to the tremendous volume of business now being carried.

## PRICES OF HEATING APPLIANCES GO HIGHER

### Demand Noticed to Be Falling Off in Certain Localities—Prospects Not so Hopeful as Could Be Desired

Effective the first of June, prices on electric heating appliances generally will be higher. This latest advance, it is understood, brings flatirons up to $5 list.

The increased prices have been necessitated by the unprecedented high cost of materials and labor. Iron and steel, which enter largely into all heating appliances, have been one of the principal items.

In certain sections of the country, particularly in the New England States and along the Atlantic seaboard, there is very little new business being done on heating appliances. The factories are running at full speed, but these orders were taken previously for this year's delivery. The central stations apparently have purchased to the full extent of their 1917 requirements. Department stores are not purchasing and they are finding conditions so dull just at

present that it is doubtful if much purchasing can be expected from this direction for some time.

The summer season, which ordinarily is a dull season for wholesale trade in appliances, is coming on, and according to present indications may be duller than usual. With higher prices, which are undoubtedly necessary, and with the falling off in demand owing to the war the prospects for the next few months as regards heating appliances are not as hopeful as they might have been otherwise.

## EXISTING CONDITIONS IN WIRE AND CABLE MARKET

### While Certain Kinds of Construction Have Fallen to a Minimum, They Have Been Offset by Gains in Industrial Development

According to all reports, conditions in the market for copper wire and cable continue to be very favorable. It is known that construction of certain kinds has been cut to a minimum, but this is made up for by the tremendous increases in industrial construction. An additional stimulus will undoubtedly be given to the market by the government's program for the expenditure of $1,000,000,000 in small ships for transporting supplies to Europe.

Recent reports to the Habirshaw Electric Cable Company, Inc., and the Electric Cable Company from correspondents in the South, Middle West and Far West point to favorable conditions. The reports, as printed in the companies' official publication, *The Wire Message*, are as follows:

Atlanta—Business conditions very favorable; good volume of construction; much building in prospect.

Chicago—Business normal; conditions good; central station and contracting work fair.

Los Angeles—Collections and money slightly tighter; residences and small building at a standstill; big business optimistic; our sales ahead of ability to supply.

Minneapolis—More conservatism apparent; unsettled price conditions; business good, but in small orders.

Salt Lake City—Prospect good; our business shows increase over last year.

## REASONS FOR INCREASE IN THE PRICES OF RANGES

### Higher Production Costs Cited with Details Concerning Difference in Price Between Gas and Electric Ranges

That the trade has not been sufficiently educated as to the reasons necessitating the increases in the price of electric ranges that have gone into effect in the last year and a half was explained in the ELECTRICAL WORLD of last week. In order to overcome this condition and lay its cards on the table, one of the prominent electric range manufacturers is mailing with a revised price list effective June 1 a folder telling briefly the extent to which production costs have increased and also some details about the difference in price of gas and electric ranges.

Within the past year labor costs have jumped 32 per cent, resistance wire 150 per cent, porcelain bricks 150 per cent, and steel 350 per cent. These are but a few of the raw materials entering the make-up of a range. The product of this particular manufacturer has taken an increase of only 30 per cent. Three increases took place this past year because the company did not want to raise its prices a penny more than was absolutely necessary at these different times. Its margin of profit to-day is a great deal smaller than it was a year ago.

Regarding comparative gas and electric range prices, a four-burner gas range and a four-burner electric range of the same style and capacity were chosen. With the exception of the gas range burners, the electric range of this concern has everything that is on a gas range, in addition to $23 worth of surface burners, $12 worth of oven burners, $10 worth of switches, $3 worth of fuse plugs and fuse blocks, and from $10 to $15 more for connecting wires, terminals, bushings, asbestos linings, oven installation, and the high-priced skilled labor it takes to assemble, weld and connect all the intricate electrical parts. This is an additional total of from $58 to $63.

On the two oven burners of this concern's product there are 198 parts. There are 172 electric spot welds. Each one takes considerable hand work on the part of nineteen skilled workmen. In other words, the electric range business is an electrical proposition, not a stove business, it is pointed out, and that is why the cost of an electrical range should not be compared with the cost of a gas range any more than should the cost of an automobile with the cost of a buggy.

## FEW NEW PRODUCTS ARE NOW BEING DEVELOPED

### Most New Pieces of Apparatus Appearing Are Only Improved Types of Equipment Already on the Market

Development of new products is becoming less and less. Most of the development work being done by manufacturers is in improvements to types already on the market. Slight changes here and there to improve operation or to cut down the expense of manufacture constitute the bulk of this activity.

Since the outbreak of war-order activity in the fall of 1915, new development work has received less attention. The manufacturers had neither the time nor the space necessary to devote to experimentation. Now there is an added reason for postponing this work. The price of labor and materials is so high that it practically prohibits the laboratory experiments necessary to produce a product that is of commercial value.

Under normal conditions, this character of work is very expensive, and with prices of material as high as they now are, and without the incentive of competition to make new products necessary, it is not difficult to understand why manufacturers should postpone developing new apparatus until present conditions change.

## METALS MARKET SHOWS LITTLE CHANGE IN WEEK JUST PAST

### Lead Prices Feel War Stimulation, Copper Slightly Easier in Sluggish Market

There has been but little change during the past week in the metals market. Lead apparently has felt the stimulation of war, and at this writing the outside price was quoted at 11 cents. Copper is somewhat easier than last week in a sluggish market. Tin is still strong, although slightly lower than last week, probably owing to technicalities. The old-metals market had strengthened slightly during the week.

Electrolytic copper was quoted nominally on Tuesday as follows: May, 32.25 cents; June, 31.25 cents; July, 30.25 cents; third quarter, 29 cents, and fourth quarter, 28 cents.

NEW YORK METAL MARKET PRICES

| | May 15 Selling Prices Bid | May 15 Selling Prices Asked | May 22 Selling Prices Bid | May 22 Selling Prices Asked |
|---|---|---|---|---|
| Copper: | £ s d | | £ s d | |
| London, standard spot | 130 0 0 | | 130 0 0 | |
| Prime Lake | 32.00 | to 33.00† | 31.50 | to 32.50† |
| Electrolytic | 32.25 | to 32.75† | 32.00 | to 32.50† |
| Casting | 30.87½ | to 31.12½† | 30.00 | to 31.00† |
| Copper wire base | 37.50† | | 37.00 | to 38.00† |
| Lead | 9.50 | | 10.00 | |
| Nickel | 50.00 | | 50.00 | |
| Sheet zinc, f.o.b. smelter | 19.00 | | 19.00 | |
| Spelter, spot | 9.30 | to 9.55 | 9.42½ | to 9.67½ |
| Tin, Straits | 66.00 | | 65.62½ | |
| Aluminum, 98 to 99 per cent. | 56.00 | to 58.00† | 56.00 | to 58.00† |

OLD METALS

| | | | | |
|---|---|---|---|---|
| Heavy copper and wire | 27.00 | to 28.00 | 28.50 | to 29.50 |
| Brass, heavy | 17.00 | to 18.00 | 17.00 | to 18.00 |
| Brass, light | 13.00 | to 14.00 | 14.00 | to 14.50 |
| Lead, heavy | 8.50 | to 8.75 | 9.00 | to 9.25 |
| Zinc, scrap | 6.50 | to 7.00 | 6.75 | to 7.00 |

†Nominal.

# Current Prices of Electrical Supplies

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

## ARMORED CONDUCTORS, FLEXIBLE STEEL

*Single-Conductor*

| B. & S. Size | List, per 1000 Ft. Chicago | N. Y. |
|---|---|---|
| No. 14 solid | $61.00 | $61.00 |
| No. 12 solid | 71.00 | 71.00 |
| No. 10 solid | 90.00 | 90.00 |
| No. 8 solid | 106.00 | 106.00 |
| No. 6 solid | 145.00 | 145.00 |
| No. 10 stranded | 95.00 | 95.00 |
| No. 8 stranded | 115.00 | 115.00 |
| No. 6 stranded | 160.00 | 160.00 |
| No. 4 stranded | 205.00 | 205.00 |
| No. 2 stranded | 266.00 | 266.00 |
| No. 1 stranded | 315.00 | 315.00 |

*Twin-Conductor*

| | | |
|---|---|---|
| No. 14 solid | 104.00 | 104.00 |
| No. 12 solid | 135.00 | 135.00 |
| No. 10 solid | 185.00 | 185.00 |
| No. 8 stranded | 235.00 | 235.00 |
| No. 6 stranded | 370.00 | 370.00 |
| No. 4 stranded | 575.00 | 575.00 |

### DISCOUNT PER 1000 FT.

*Single-Conductor*

| No. 14 solid: | Chicago | N. Y. |
|---|---|---|
| Less than coil | +10% | +10% |
| Coil to 1000 ft. | —10% | 3% |
| No. 12 solid: | | |
| Less than coil | +10% | +10% |
| Coil to 1000 ft. | —10% | 3% |

*Twin-Conductor*

| | | |
|---|---|---|
| No. 14 solid: | | |
| Less than coil | +10% | +10% |
| Coil to 1000 ft. | —10% | 3% |
| No. 12 solid: | | |
| Less than coil | +10% | 10% |
| Coil to 1000 ft. | —10% | 3% |

## ATTACHMENT PLUGS

| | Std. Pkg. | List Chicago | List N. Y. |
|---|---|---|---|
| Benjamin No. 903 | 100 | $0.25 | $0.25 |
| Hubbell No. 5406 | 250 | .30 | .30 |
| Bryant No. 706 | 100 | .25 | .25 |
| G. E. 50996 | 250 | .22 | .22 |
| Discount | | Chicago | N. Y. |
| Less than 1/5 std. pkg.: | | | |
| Benjamin No. 903 | | 12% | 12% |
| Hubbell No. 5406 | | +10% | +20% |
| Bryant No. 706 | | +20% | +20% |
| G. E. 50996 | | +20% | +20% |
| 1/5 to std. pkg.: | | | |
| Benjamin No. 903 | | 20% | 20% |
| Hubbell No. 5406 | | —10% | 20% |
| Bryant No. 706 | | Net | 20% |
| G. E. 50996 | | Net | 20% |
| Std. pkg.: | | | |
| Benjamin No. 903 | | 44% | 44% |
| Hubbell No. 5406 | | —34% | 34% |
| Bryant No. 706 | | 30% | 34% |
| G. E. 50996 | | —30% | 34% |

## BATTERIES, DRY

| Each Net | No. 6 Regular Chicago | No. 6 Regular N. Y. | No. 6 Ignitor Chicago | No. 6 Ignitor N. Y. |
|---|---|---|---|---|
| Less than 12 | $0.35 | $0.35 | $0.35 | $0.35 |
| 12 to 50 | .30 | .30 | .30 | .30 |
| 50 to barrel | .255 | .28 | .265 | .29 |
| Barrel lots | .24 | .24 | .25 | .25 |

## CONDUIT, METALLIC FLEXIBLE

| Size, In. | Feet per Coil | List per 100 Ft. Chicago | List per 100 Ft. N. Y. |
|---|---|---|---|
| 5/16 | 250 | $5.00 | $5.00 |
| 3/8 | 250 | 7.50 | 7.50 |
| 1/2 | 100 | 10.00 | 10.00 |
| 5/8 | 50 | 13.00 | 13.00 |
| 3/4 | 50 | 21.00 | 21.00 |
| 1 | 50 | 26.00 | 26.00 |
| 1 1/4 | 25-50 | 35.00 | 35.00 |
| 1 1/2 | 25-50 | 45.00 | 45.00 |
| 2 | 25-50 | 52.00 | 52.00 |
| 2 1/2 | | | |

## CONDUIT, METALLIC FLEXIBLE—CONTINUED

| | 3/8" Single Strip Chicago | 3/8" Single Strip N. Y. | 3/8" Double Strip Chicago | 3/8" Double Strip N. Y. |
|---|---|---|---|---|
| Less than coil per 1000 ft., net | $75.00 | $75.00 | $78.75 | $82.50 |
| Cost to 1000 ft. per 1000 ft., net | 63.75 | 69.30 | 71.25 | 75.00 |
| | 1/2" Single Strip Chicago | 1/2" Single Strip N. Y. | 1/2" Double Strip Chicago | 1/2" Double Strip N. Y. |
| Less than coil per 1000 ft., net | $100.00 | $100.00 | $105.00 | $110.00 |

## CONDUIT, NON-METALLIC FLEXIBLE

| Size, in. | List, per Foot Chicago | List, per Foot N. Y. | Size, in. | List, per Foot Chicago | List, per Foot N. Y. |
|---|---|---|---|---|---|
| 7/32 | $0.05 1/2 | $0.05 1/2 | 1 | $0.25 | $0.25 |
| 1/4 | .06 | .06 | 1 1/4 | .33 | .33 |
| 3/8 | .09 | .09 | 1 1/2 | .40 | .40 |
| 1/2 | .12 | .12 | 1 3/4 | .47 | .47 |
| 5/8 | .15 | .15 | 2 | .55 | .55 |
| 3/4 | .18 | .18 | 2 1/4 | .65 | .65 |

| Per 1000 Ft. Net. | 7/32 In. Chicago | 7/32 In. N. Y. | 1/4 In. Chicago | 1/4 In. N. Y. |
|---|---|---|---|---|
| Less than $15.00 list | $55.00 | $55.00 | $60.00 | $60.00 |
| $15.00 to $60.00 list | 27.50 | 24.50 | 30.00 | 27.00 |
| $60.00 to $150.00 list | 24.75 | 21.50 | 27.00 | 23.50 |

## CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

(*Card No. 38*)

| Size, in. | Conduit, List per Foot Chicago | Conduit, List per Foot N. Y. |
|---|---|---|
| 1/4 | $0.08 1/2 | $0.08 1/2 |
| 3/8 | .08 1/2 | .08 1/2 |
| 1/2 | .08 1/2 | .08 1/2 |
| 3/4 | .11 1/2 | .11 1/2 |
| 1 | .17 | .17 |
| 1 1/4 | .23 | .23 |
| 1 1/2 | .27 1/2 | .27 1/2 |
| 2 | .37 | .37 |
| 2 1/2 | .58 1/2 | .58 1/2 |
| 3 | .76 1/2 | .76 1/2 |

| Size, in. | Couplings, List, Each Chicago | Couplings, List, Each N. Y. | Elbows, List, Each Chicago | Elbows, List, Each N. Y. |
|---|---|---|---|---|
| 1/4 | $0.05 | $0.05 | $0.19 | $0.19 |
| 3/8 | .06 | .06 | .19 | .19 |
| 1/2 | .07 | .07 | .19 | .19 |
| 3/4 | .10 | .10 | .25 | .25 |
| 1 | .13 | .13 | .37 | .37 |
| 1 1/4 | .17 | .17 | .45 | .45 |
| 1 1/2 | .21 | .21 | .60 | .60 |
| 2 | .28 | .28 | 1.10 | 1.10 |
| 2 1/2 | .40 | .40 | 1.80 | 1.80 |
| 3 | .60 | .60 | 4.80 | 4.80 |
| | Discount, | | Discount, | |

| | 1/4 In. to 1/2 In. Chicago | 1/4 In. to 1/2 In. N. Y. | 3/4 In. to 3 In. Chicago | 3/4 In. to 3 In. N. Y. |
|---|---|---|---|---|
| Less than 2500 lb | 3.8% | 7% | 6.8% | 10% |
| 2500 to 5000 lb. | 5.8% | 9% | 8.8% | 12% |

(For galvanized deduct six points from above discounts.)

## FLATIRONS

| | Chicago | N. Y. |
|---|---|---|
| List | $5.50 | $5.00 |
| Discount | 30% | 30% |

## FUSES, INCLOSED

| 250-Volt | Std. Pkg. | List Chicago | List N. Y. |
|---|---|---|---|
| 3-amp. to 30-amp. | 100 | $0.25 | $0.25 |
| 35-amp. to 60-amp. | 100 | .35 | .35 |
| 65-amp. to 100-amp. | 50 | .90 | .90 |
| 110-amp. to 200-amp. | 25 | 2.00 | 2.00 |
| 225-amp. to 400-amp. | 25 | 3.60 | 3.60 |
| 450-amp. to 600-amp. | 10 | 5.50 | 5.50 |
| 600-Volt | | | |
| 3-amp. to 30-amp. | 100 | $0.40 | $0.40 |
| 35-amp. to 60-amp. | 100 | .60 | .60 |
| 65-amp. to 100-amp. | 50 | 1.50 | 1.50 |
| 110-amp. to 200-amp. | 25 | 2.50 | 2.50 |
| 225-amp. to 200-amp. | 25 | 5.50 | 5.50 |
| 450-amp. to 600-amp. | 10 | 8.00 | 8.00 |

### FUSES, INCLOSED—CONTINUED

| Discount | Chicago | N. Y. |
|---|---|---|
| List | 28% | 28% |
| Discount | 38% | 38% |

### FUSE PLUGS

*3-Amp. to 30-Amp.*

| Per 100 Net. | Chicago | N. Y. |
|---|---|---|
| Less than 1/5 std. pkg. | $6.25 | $5.25 |
| 1/5 to std. pkg. | 5.25 | 4.50 |

Standard package, 500. List, $0.07.

### LAMPS, MAZDA

*105 to 125 Volts*

| Regular, clear: | Std. Pkg. | List, Each—Chicago | List, Each—N. Y. |
|---|---|---|---|
| 10 to 40-watt—B | 100 | $0.27 | $0.27 |
| 60-watt—B | 100 | .36 | .36 |
| 100-watt—B | 24 | .65 | .65 |
| 75-watt—C | 50 | .65 | .65 |
| 100-watt—C | 24 | 1.00 | 1.00 |
| 200-watt—C | 24 | 2.00 | 2.00 |
| 300-watt—C | 24 | 3.00 | 3.00 |
| Round bulbs, 3½-in., frosted: | | | |
| 15-watt—G 25 | 50 | .50 | .50 |
| 25-watt—G 25 | 50 | .50 | .50 |
| 40-watt—G 25 | 50 | .50 | .50 |
| Round bulbs, 3¾-in., frosted: | | | |
| 60-watt—G 30 | 24 | .72 | .72 |
| Round bulbs, 4⅝-in., frosted: | | | |
| 100-watt—G 35 | 24 | 1.05 | 1.05 |

| Discount | Chicago | N. Y. |
|---|---|---|
| Less than std. pkg. | Net | Net |
| Std. pkg. | 10% | 10% |

### LAMP CORD

*Cotton-Covered, Type C, No. 18*

| | Per 1000 Ft. Net—Chicago | Per 1000 Ft. Net—N. Y. |
|---|---|---|
| Less than coil (250 ft.) | $37.52 | $35.17 |
| Coil to 1000 ft. | 28.14 | 26.73 |

### LAMP GUARDS, WIRE

| Per 100 Net | Chicago | N. Y. |
|---|---|---|
| Less than 50, Matthews 16-cp. | $20.00 | $20.00 |
| Less than 1/5 std. pkg. Hubbell | 28.35 | 29.00 |
| Less than 36, 60-watt Loxon | 30.00 | 25.00 |

### OUTLET BOXES

| Union Cat. No. | Black, List, per 100—Chicago | Black, List, per 100—N. Y. |
|---|---|---|
| 101 | $30.00 | $30.00 |
| 102 | 30.00 | 30.00 |
| 103 | 25.00 | 25.00 |
| 106 | 20.00 | 20.00 |

| Union Cat. No. | Galv., List, per 100—Chicago | Galv., List, per 100—N. Y. |
|---|---|---|
| 101 | $30.00 | $30.00 |
| 102 | 30.00 | 30.00 |
| 103 | 25.00 | 25.00 |
| 106 | 20.00 | 20.00 |

| Discount | Black—Chicago | Black—N. Y. | Galvanized—Chicago | Galvanized—N. Y. |
|---|---|---|---|---|
| Less than $10.00 list | 40% | List | 35% | List |
| $10.00 to $50.00 list | 50% | 42% | 45% | 37% |

### PIPE FITTINGS

*Condulets, V.V., Unilets and Similar*

| Discount | Chicago | N. Y. |
|---|---|---|
| Less than 1/5 std. pkg. | 10% | 10% |
| 1/5 to std. pkg. | 20% | 20% |
| Std. pkg. | 30% | 30% |

### PORCELAIN CLEATS—UNGLAZED

*2 and 3 Wire*

| | Per 1000 Net—Chicago | Per 1000 Net—N. Y. |
|---|---|---|
| Less than 1/5 std. pkg. | $18.00 | $20.00 |
| 1/5 to std. pkg. | 13.00 | 15.80 |

Standard package, 2200. List per 1000, $20.

### PORCELAIN KNOBS

| Per 1000 Net | 5½ N.C.—Solid Std. Pkg. 3500 Chicago | 5½ N.C.—Solid Std. Pkg. 3500 N. Y. | Nail-it—N.C. Std. Pkg. 4000 Chicago | Nail-it—N.C. Std. Pkg. 4000 N. Y. |
|---|---|---|---|---|
| Less than 1/5 std. pkg. | $18.00 | $24.30 | $20.75 | $28.00 |
| 1/5 to std. pkg | 9.00 | 12.15 | 16.30 | 21.50 |

### SOCKETS AND RECEPTACLES

| | Std. Pk. | List—Chicago | List—N. Y. |
|---|---|---|---|
| ¼-in. cap key socket | 500 | $0.33 | $0.33 |
| ¼-in. cap keyless socket | 500 | .30 | .30 |
| ⅛-in. cap pull socket | 250 | .60 | .60 |

| Discount | Chicago | N. Y. |
|---|---|---|
| Less than 1/5 std. pkg. | Net | Net |
| 1/5 to std. pkg. | 15% | 15% |

### SWITCHES, KNIFE

*250-Volt, Front Connections, No Fuse*

| Perkins or Trumbull Type A: | List—Chicago | List—N. Y. |
|---|---|---|
| 30-amp. S. P. S. T. | $0.80 | $0.80 |
| 60-amp. S. P. S. T. | 1.20 | 1.20 |
| 100-amp. S. P. S. T. | 2.25 | 2.25 |
| 200-amp. S. P. S. T. | 3.48 | 3.48 |
| 300-amp. S. P. S. T. | 5.34 | 5.34 |
| 30-amp. D. P. S. T. | 1.20 | 1.20 |
| 60-amp. D. P. S. T. | 1.78 | 1.78 |
| 100-amp. D. P. S. T. | 3.38 | 3.38 |
| 200-amp. D. P. S. T. | 5.20 | 5.20 |
| 300-amp. D. P. S. T. | 8.00 | 8.00 |
| 30-amp. 3 P. S. T. | 1.80 | 1.80 |
| 60-amp. 3 P. S. T. | 2.68 | 2.68 |
| 100-amp. 3 P. S. T. | 5.08 | 5.08 |
| 200-amp. 3 P. S. T. | 7.80 | 7.80 |
| 300-amp. 3 P. S. T. | 12.00 | 12.00 |
| Perkins Type B or Trumbull Type C: | | |
| 30-amp. S. P. S. T. | 0.42 | 0.42 |
| 60-amp. S. P. S. T. | 0.74 | 0.74 |
| 100-amp. S. P. S. T. | 1.50 | 1.50 |
| 200-amp. S. P. S. T. | 2.70 | 2.70 |
| 30-amp. D. P. S. T. | 0.68 | 0.68 |
| 60-amp. D. P. S. T. | 1.22 | 1.22 |
| 100-amp. D. P. S. T. | 2.50 | 2.50 |
| 200-amp. D. P. S. T. | 4.50 | 4.50 |
| 30-amp. 3 P. S. T. | 1.02 | 1.02 |
| 60-amp. 3 P. S. T. | 1.84 | 1.84 |
| 100-amp. 3 P. S. T. | 3.76 | 3.76 |
| 200-amp. 3 P. S. T. | 6.76 | 6.76 |

DISCOUNT

| Type A, Perkins or Trumbull: | Chicago | N. Y. |
|---|---|---|
| Less than $10 list | List | Net |
| $10 to $25 list | 15% | 15% |
| $25 to $50 list | 18% | 18% |
| Type B, Perkins, or Type C, Trumbull: | | |
| Less than $10 list | 10% | 10% |
| $10 to $25 list | 20% | 20% |
| $25 to $50 list | 28% | 28% |

### SWITCHES, SNAP AND FLUSH

*5-Amp. and 10-Amp., 125-Volt Snap Switches*

| | Std. Pkg. | List—Chicago | List—N. Y. |
|---|---|---|---|
| 5-amp. single-pole | 250 | $0.28 | $0.28 |
| 5-amp. single-pole, ind. | 250 | .32 | .32 |
| 10-amp. single-pole | 100 | .48 | .48 |
| 10-amp. single-pole, ind. | 100 | .54 | .54 |
| 5-amp., three-point | 100 | .56 | .56 |
| 10-amp., three-point | 50 | .76 | .76 |
| 10-amp., 250-volt, D. P. | 100 | 66 | .66 |

*10-Amp., 250-Volt Push-Button Switches*

| | Std. Pkg. | List—Chicago | List—N. Y. |
|---|---|---|---|
| 10-amp. single-pole | 100 | $0.45 | $0.45 |
| 10-amp. three-way | 50 | .70 | .70 |
| 10-amp. double-pole | 50 | .70 | .70 |

| Discount | Chicago | N. Y. |
|---|---|---|
| Less than 1/5 std. pkg. | +20% | Net |
| 1/5 to std. pkg. | Net | 15% |
| Std. pkg. | 30% | 28% |

### SWITCH BOXES, SECTIONAL CONDUIT

| C. F. Mfg. Co. | List, Each—Chicago | List, Each—N. Y. |
|---|---|---|
| No. 155 | $0.34 | $0.34 |
| No. 160 | 0.60 | 0.60 |

| Discount | Black—Chicago | Black—N. Y. | Galvanized—Chicago | Galvanized—N. Y. |
|---|---|---|---|---|
| Less than $2.00 list | 25% | Net | 20% | Net |
| $2.00 to $10.00 list | 25% | 50% | 20% | 40% |
| $10.00 to $50.00 list | 25% | 60% | 20% | 52% |

### TOASTERS, UPRIGHT

| | Chicago | N. Y. |
|---|---|---|
| List | $5.00 | $5.00 |
| Discount | 30% | 30% |

### WIRE, ANNUNCIATOR

| Per Lb. Net | Chicago | N. Y. |
|---|---|---|
| No. 18, less than full spools | $0.65 | $0.62 |
| No. 18, full spools | 0.55 | 0.53 |

### WIRE, RUBBER-COVERED, N. C.

*Solid-Conductor, Single-Braid*

| | Price per 1000 Ft. Net—Less than 500 Ft. | | 500 to 1000 Ft. | | 1000 to 5000 Ft. | |
|---|---|---|---|---|---|---|
| No. | Chicago | N. Y. | Chicago | N. Y. | Chicago | N. Y. |
| 14 | $18.00 | $18.00 | $16.00 | $14.50 | $14.00 | $12.50 |
| 12 | 29.89 | 27.05 | 25.62 | 22.85 | 21.35 | 20.95 |
| 10 | 41.51 | 39.27 | 35.58 | 33.66 | 29.65 | 24.68 |
| 8 | 60.13 | 51.44 | 51.54 | 48.42 | 42.95 | 33.51 |
| — | 82.20 | 89.57 | 75.35 | 76.80 | 68.50 | 50.63 |

### WIRE, WEATHER-PROOF

*Solid-Conductor, Triple-Braid, Sizes 4/0 to 8, Inc.*

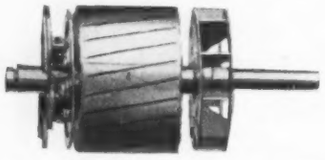
| | Per 100 Lb. Net—Chicago | Per 100 Lb. Net—N. Y. |
|---|---|---|
| Less than 25 lb. | $45.00 | $40.25 |
| 25 to 50 lb. | 44.00 | 39.25 |
| 50 to 100 lb. | 43.00 | 38.25 |

# NEW APPARATUS AND APPLIANCES

*A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field*

## Washing Machine Motors

Washing machine motors which have a high starting and pull-out torque at any position of the rotor have been developed by the Domestic Electric Company of Cleveland, Ohio. Among other characteristics pointed out for this



ROTOR OF WASHING MACHINE MOTOR

motor are its low starting current and cool operation under heavy overload. The motors are equipped with ball bearings. By using a bracket design the motors have been made splash-proof, it is claimed, when mounted in any position. A ribbed cast-iron frame is used for holding the stator steel punchings. The feet are cast integral with the frame and machined so that the shaft is always parallel to the base. The rotor core is substantially built of thin steel punchings, which are fastened together with copper rivets. The rivets serve as conductors and are short-circuited by copper end rings. In designing the starting switch, it is claimed, all unnecessary moving parts were eliminated. The only current-carrying parts are the stationary contact rings and the moving contact fingers. These motors are supplied with 10 ft. (3 m.) of waterproof cord and a connecting plug.

## Spraying Outfits

Outfits for spraying the finish on wood and metal products with compressed air are made by the De Vilbiss Manufacturing Company of Toledo, Ohio. These outfits come in a wide range of capacities for handling very small parts of large pieces. The booths are constructed of heavy sheet steel on an angle-iron frame, with wire-glass windows in the sides and top and with a sheet-steel floor. Reflectors and sockets are built in the booths for lamps, and a portable spot-light is supplied and so arranged that it can be clamped on the frame in any desired position to direct the light upon the work. The back of the booth is funnel-shaped, an exhaust fan being mounted at the apex of the funnel. A 1/6-hp. Robbins & Myers motor of special design is used to drive the six-blade 16-in. (40.6 cm.) fan employed. The motor is completely inclosed to protect it from the fumes, but is provided with thorough ventilation by a stream of cool air which is drawn through the motor by the fan, the intake for the air being provided by a tube which opens outside the booth. This tube also serves to support the fan and is so arranged that the fan will swing back from the opening to give access to the blades. The exhaust fan is made in one size only, two or more fans, depending upon the requirements, being used in the larger booths. Where desired the sprayer is equipped with an electric heater which heats the air and finishing material before it leaves the spray nozzle.

As shown in the accompanying illustration, the outfits can also be furnished with a motor-driven turntable for supporting the work. The speed of rotation is adjustable through a wide range by a friction wheel and the disk oper-

SPRAYING OUTFIT FURNISHED WITH MOTOR-DRIVEN TURNTABLE

ated by a ⅛-hp. Robbins & Myers motor. It can be raised and lowered through a 10-in. (25.4 cm.) range by compressed air acting upon a piston which supports the revolving parts.

## Motor-Driven Pump

To take the place of water lifts and for use either with open tanks or pressure tanks the Chandler Pump Company of Cedar Rapids, Iowa, has developed a motor-driven pump. It is designed for automatic switch control, either by the height of the water in an open tank or by pressure in an inclosed tank. Automatic switches for either class of tank can be supplied. The pump is made of heavy brass and has a two-lever brass plunger and a reliable check valve.

## Unit Oven Range

The range shown in the accompanying illustration consists of one oven and four square hot plates, each provided with a three-heat switch, cut-out and inclosed fuses. The oven has a clear working space 27 in. (68.6 cm.) deep, 21.5 in. (54.6 cm.) wide and 16 in. (40.6 cm.) high. The heaters are enamel-incased and are situated in both the top and bottom of the oven. The walls are highly insulated. Square flush heaters of the inclosed Simplex-Hewitt type are used for the hot plates. Each heater is 14 in. (35.6 cm.) square and is heated over the entire surface. At high heat a very high temperature is obtained which is comparable with that which can be obtained by coal or gas.

The switches are placed in a flush panel in front and at one side of the oven. By removing the panel the switches, fuses and their connections are made accessible. On this switch panel is also a plug switch for connecting any extra heating appliance, such as a broiler, a rim griddle, a water heater or other auxiliary apparatus that might be found desirable by the purchaser.

The entire wiring of the range is very carefully laid to prevent its coming in contact with grease or moisture, and the heater connections may be easily reached. At high heat the oven takes 3.3 kw. and each of the square heaters approximately 4 kw. This makes a total connected load of 19.3 kw. As all of the heating elements are seldom used at one time it can be estimated that 12 kw. would be an unusually heavy demand.

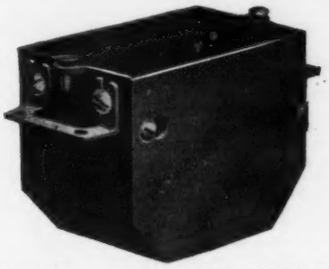
The manufacturer points out that the top heaters are constructed by a new method allowing high wattage and intense heat to be obtained without damaging the elements. The range, it

HOTEL TYPE OF UNIT OVEN RANGE

is said, is mechanically constructed so that it is rugged throughout. This range is made by the Simplex Electric Heating Company of Cambridge, Mass.

## Switch Box

Sectional switch boxes that have one fixed guard and which may be easily assembled are made by the Acme Metal Stamping Company of Cleveland, Ohio. The knockouts on these boxes are uniformly secured. Those on the beveled



SECTIONAL SWITCH BOX WITH ONE REMOVABLE SIDE

corners may be removed by tapping on the inside with a screwdriver or similar instrument, while the large knockout on the side may be removed by striking on the outside. Beveled corners, the manufacturer declares, have a decided advantage over square corners in many ways. The ears are reversible and adjustable.

## Double-Tub Washer

A double-tub vacuum washer, equipped with a 0.25-hp. Emerson motor, is a product of the Dexter Company of Fairfield, Iowa. By keeping both washing tubs in operation and continuing the process of wringing and rinsing from one to another, it is claimed that there is a material saving in time necessary to complete a washing, particularly where a large quantity of clothes is to be handled. The tubs are equipped with cone-shaped plungers, which clean the clothes by the vacuum process, which is assisted by the rotary motion imparted to the mass of garments by the action of the plunger head. The action of the plunger head in each tub is governed by the opening and closing of the lids of these tubs.

## Electric Radiator

An electric radiator designed for use in bathrooms and other places of small dimensions is shown in the accompanying illustration. It is designed to be used on either table or floor and has

RADIATOR FOR BATHROOMS

handles provided for lifting. The size of the radiator is 7 in. by 11 in. (17.8 cm. by 27.9 cm.), and it is rated at 500 watts. The device is offered to the trade by the Pelouze Manufacturing Company, 232 East Ohio Street, Chicago.

## Condulet Switch

The Crouse-Hinds Company of Syracuse, N. Y., has placed on the market a line of condulets that includes a fusible knife switch inclosed in a cast-iron box with a hinged cover. In this cover is a door which furnishes access to the fuse compartment. The design is such, however, as to prevent this door from being opened when the switch blades are closed. The switch is operated by a handle outside the case, and provision is made for locking this handle in either the "on" or "off" position. While these condulet switches are not regularly furnished with a quick-make and quick-break mechanism, they will be so furnished if a purchaser desires. These series condulets possess another desirable feature in that they

CONDULET WITH QUICK MAKE-AND-BREAK ATTACHMENT

are provided with separable hub plates —blank, single-hub and two-hub plates. The latter two are made to take standard sizes of conduit from 0.5 in. to 3.5 in. (1.27 cm. to 8.8 cm.). This makes it possible to equip the condulet for almost any arrangement of conduit installation and simplifies the work of installing. This device is made in numerous capacities, ranging from 30-amp., two or three-pole, 125-volt, to 200-amp., 500-volt, alternating-current three-pole switches, arranged for N. E. C. fuses.

## Double-Tub Electric Washer

A double-tub electric washer in which all gears are accurately bored and carefully machined is being offered to the trade by the Globe Manufacturing Company of Perry, Iowa. The shafting for all gears that mesh runs in bearings or boxings cast in one frame. A wringer with 12-in. (30.48-cm.) wringer rollers is supplied with this washer. The wringer can be swung into any desired position. The frame is made of angle steel, is machine-riveted and well braced. Louisiana red cypress is used for the tubs. The cross-arm dollies grip the clothes firmly, do not damage them, and are thorough in their action of whirling the clothes back and forth through the hot soapy water. While the dollies are fastened to the dolly shaft they adjust themselves auto-

ELECTRIC WASHING MACHINE

matically to the clothes in the tub. They are hung within 2 in. (5.08 cm.) of the bottom of the tub, making it possible to wash small as well as large quantities of clothes. Locking the tub lids starts the washing mechanism in motion. All exposed moving parts are entirely inclosed. The machine is equipped with a ¼-hp. motor, wound to carry momentary overloads. The motor is equipped with a fiber gear.

## Motor Chair

An electric-motor chair furnished with either 150 amp.-hr. or 200 amp.-hr. batteries is made by the Ford Motor Chair Company of Lafayette, Ind. The 150-amp.-hr. battery when fully charged will give five hours of continuous running service, it is said, and the 200-amp.-hr. battery will give seven hours. The batteries are of the 12-volt type and the motor is designed to develop 0.5 hp. to 2 hp., according to load. The motor is geared directly to the axle of the front wheel with a triple worm which permits the motor to propel the car up a 15 per cent grade when loaded with two adults. Extending in front

ELECTRIC WHEEL CHAIR

of the car is a guard which breaks the circuit between the batteries and motor and applies the brake when it comes in contact with any obstacle.

## Trade Notes

PASS & SEYMOUR, INC., Solvay, N. Y., has commenced the erection of a three-story addition to its plant, about 60 ft. by 185 ft.

THE MOORE STEAM TURBINE COMPANY, Wellsville, N. Y., has increased its capital from $160,000 to $260,000 for expansion.

THE AMERICAN CONDUIT COMPANY, 140 Nassau Street, New York, is building a new plant at Fulton, N. Y., for the manufacture of its specialties.

THE BABCOCK & WILCOX COMPANY, Bayonne, N. J., manufacturer of boilers, will build an extension to its plant on Third Street, providing for expansion in the boiler and marine shops.

THE DRIVER-HARRIS WIRE COMPANY, Harrison, N. J., has filed notice of change in company name to the Driver-Harris Company, Inc. The capital of the company has been increased to provide for business extensions.

THE MORGAN CRUCIBLE COMPANY, New York City, has moved from 114 Liberty Street to 519 West Thirty-eighth Street. The company's factory, which has been in Brooklyn, is now being moved to New York so that it will not only have larger quarters but also gain the advantage of having factory and office under one roof.

THE HYATT ROLLER BEARING COMPANY, Newark, N. J., announces that owing to advances in the costs of the raw materials that enter into the manufacture of Hyatt flexible roller bearings—advances that range from 10 to 50 per cent—and the higher wage rates prevailing in the labor markets, it has been found necessary to advance prices.

THE McCAUSLAND ENGINEERING COMPANY, Pennsylvania Building, Philadelphia, Pa., recently organized, is arranging for early operations at its new plant on Fifth Street, Chester, for the manufacture of electric motors. Contract has been awarded for improvements and extensions in three existing factory buildings to accommodate the new industry, totaling $50,000.

THE CASEY-MOORHEAD ENGINEERING COMPANY has opened offices in the Bessemer Building, Pittsburgh, Pa., as a firm of consulting electrical engineers, furnishing appraisals, estimates, reports, plans and specifications on electrical apparatus applied to industrial plants and coal mines. Both Mr. Moorhead and Mr. Casey were formerly with the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

THE VULCAN FUEL ECONOMY COMPANY, Chicago, announces that hereafter all $CO_2$ recorders, gas analyzers, gas collectors and draft gages sold by the company will be known as Vulcan instruments, manufactured under the Hays patent rights. There is no change in the design of any of these instruments. Since Jan. 1 the company has sold soot cleaners for boilers amounting to more than 106,000 hp. Of these orders 51 per cent were repeat.

THE GENERAL ELECTRIC COMPANY will soon commence manufacturing operations in its new plant at Philadelphia. The structure will provide a floor area of about 125,000 sq. ft., covering a large section of the block bounded by Seventh, Willow, Marshall and Noble Streets. It will be six stories in height and give employment to more than 1000 people. The company is reported to be planning the erection of a large addition on the remaining portion of the block.

THE BARE WIRE COMPANY, INC., has been incorporated under the laws of the State of New York with a capitalization of $500,000. The offices of the company are at 10 East Forty-third Street, New York City. This company has acquired from the New York Central Railroad a tract of land in Yonkers. It will proceed to erect a building and install modern machinery for the manufacture of all forms of bare copper wires and cables. The company is closely affiliated with the Habirshaw Electric Cable Company and the Electric Cable Company. The most difficult problem that large manufacturers of insulated wires and cables have had to deal with during the past two years has been to secure a prompt and adequate supply of bare wire. One of the principal purposes of the new company is to assure the Habirshaw Electric Cable Company, Inc., and the Electric Cable Company an adequate supply at all times of every size of wire needed to enable them to give prompt and efficient service to their customers. The incorporators of the Bare Wire Company are Edwin W. Moore, J. Nelson Shreve, G. F. Waterbury, John S. Keith and Thomas C. Perkins.

NEW HYDROELECTRIC CONSTRUCTION IN FRANCE.—William H. Cole is in this country in charge of three undertakings in which the French government is indirectly interested. One of these projects is in connection with proposed hydroelectric work in the French Alps and Pyrenees, a development made desirable at this time by the scarcity of coal in France. This work will be undertaken by the Société d'Hydraulique Foncière et Industrielle, recently organized in Paris with a paid-up capital stock of 25,000,000 francs. According to Mr. Cole, most of the hydroelectric machinery required in the developments now to be undertaken by this company will be purchased in America. Allied with this company is a second corporation, the Société Centrale d'Industrie, whose purpose will be to distribute and use this power. The water power first developed will be in the Alps, and part of it will be used for the operation of sections of the Midi Railway. Both of these companies hold franchises for 100 years, granted by the French government. A third mission undertaken by Mr. Cole on this trip is in connection with the rehabilitation of the portions of northern France and Belgium retaken from the Germans. This undertaking will be carried out by an organization known as the American Bank Franco-Belgique. Mr. Cole is a member of the A. I. E. E., and his professional work in the past has included active connection with electric railways in Rio de Janeiro, Buenos Aires, Mexico City and Singapore.

## Trade Publications

ANCHORS.—W. N. Matthews & Brother of St. Louis are mailing a folder descriptive of their "Scrulix" anchors.

LAMPS.—Catalog No. 17, descriptive of gas and electric portable lamps, has been prepared by Young & Russell, Philadelphia.

GROUND CONE.—Hickey & Schneider of 61 Broadway, New York City, have prepared bulletin No. 50, descriptive of the Burn-Boston carbon-ground cone.

SCREENS.—Traveling water screens for condenser intakes are illustrated and described in book No. 305, recently prepared by the Link-Belt Company of Chicago, Ill.

SWITCHES.—The V. V. Fittings Company of Philadelphia is mailing a folder descriptive of its safety switches, designed to protect the operator as well as the whole installation.

INSULATING MATERIALS.—An insulating guide has been prepared by the John C. Dolph Company of Newark, N. J. This is a descriptive catalog of this company's insulating varnishes and compounds.

PROJECTORS.—The Wheeler Reflector Company of Boston has prepared bulletin F, descriptive of its floodlight projectors. These projectors are for use with 400-watt floodlighting Mazda lamps with mogul base.

LINE MATERIAL.—A treatise on live-line material has been prepared by Hickey & Schneider of 61 Broadway, New York City. This treatise includes information and illustrations regarding the Johnson transmission tap clamps, insulator fault finder and insulator changer.

SUPPLIES.—The Northwestern Electric Company, Portland, Ore., has compiled a booklet giving an alphabetical list of all Portland dealers and contractors, members of the Oregon Association of Electrical Contractors and Dealers, which is given to each caller asking for prices on electrical work or supplies. The customer thus knows where to reach the men with whom he prefers to do business.

WAGON AND TRUCK LOADERS.—The Link-Belt Company of Chicago has prepared book No. 270, descriptive of its wagon and truck loaders for handling coal, coke, stone, sand, fertilizer and similar loose materials from storage. In this book are given illustrations, specifications and net prices of standard wagon loaders, and some of the special machines are shown which have been built to meet individual requirements.

WINDOW DISPLAY SERVICE.—A binder containing illustrations and instructions for the setting up of window displays has been prepared by the Western Electric Company. Realizing that the electrical merchant is often too busy to form original ideas and to "hand-letter" attractive display cards, this company offers to the dealers a window display service consisting of complete sets of cards and illustrations and complete instructions for the setting up of business-getting displays. From time to time new displays will be issued, to be placed in the binder.

## New Incorporations

THE GRAY ELECTRIC COMPANY of Detroit, Mich., has been incorporated with a capital stock of $10,000 by John C. Gray, L. Gray and W. L. Gray.

THE GRAHAM (TEX.) ELECTRIC & AUTO COMPANY has been chartered with a capital stock of $27,000 by J. E. Dowdle, W. F. Babb and B. P. Walker.

THE J. C. LEWIS ELECTRIC COMPANY of Massillon, Ohio, has been chartered with a capital stock of $15,000 by J. C. Lewis and David H. Lewis.

THE LEET (PA.) TOWNSHIP ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by E. S. Haymond and others to operate in Leet Township.

THE LAUTON-ADAMS ELECTRIC COMPANY of New York, N. Y., has been incorporated with a capital stock of $10,000. Edward Schuster of Brooklyn, N. Y., is one of the directors.

THE ST. LOUIS (MO.) BATTERY COMPANY has been incorporated by August Mangold, Barton R. Ford and Roy J. Ward. The company proposes to manufacture storage batteries, etc.

THE CHESTER JOHNSON ELECTRIC COMPANY of Chicago, Ill., has been incorporated with a capital stock of $10,000 by Chester M. Johnson, Eugene Henry Johnson and Walter J. Johnson.

THE HARMONY (PA.) TOWNSHIP LIGHT COMPANY has been chartered with a capital stock of $5,000 to operate in Harmony Township. E. S. Raymond of Wilkinsburg, Pa., is interested in the company.

THE COMMERCIAL ELECTROLYTIC CORPORATION of Los Angeles, Cal., has been chartered with a capital stock of $100,000 by F. E. Stevens, J. McWilliams, Jr., R. T. Laughlin, J. R. Mason and F. F. Wehrle.

J. & P. DAVIGNON of Montreal, Que., has been incorporated by Joseph and Pierre Davignon, Joseph A. Lacasse and others. The company is capitalized at $45,000 and proposes to manufacture electrical machinery, etc.

THE FINLEY (PA.) TOWNSHIP ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 to operate in Finley Township. E. S. Raymond of Wilkinsburg, Pa., is interested in the company.

THE EDGEWORTH (PA.) ELECTRIC LIGHT COMPANY has been granted a charter with a capital stock of $5,000 to supply electrical service in Edgeworth. E. S. Raymond of Wilkinsburg, Pa., is one of the incorporators.

THE RADIO-DENTAL X-RAY SOCIETY of New York, N. Y., has been incorporated with a capital stock of $15,000 to do a general X-ray and radiographing business. The incorporators are: Harry Rosenthal, Sophia and Bertha Rosenthal.

THE HOPEWELL (PA.) TOWNSHIP ELECTRIC LIGHT COMPANY has been granted a charter with a capital stock of $5,000 to furnish electricity in Hopewell Township. E. S. Raymond of Wilkinsburg, Pa., is one of the incorporators.

THE COTO-COIL COMPANY of Boston, Mass., has been incorporated with a capital stock of $100,000 to manufacture machines for electric coil winding. Robert A. Leeson is president and Frank N. French, 95 South Street, Boston, Mass., is treasurer.

THE ASSOCIATED LAMP & FIXTURE CORPORATION of New York, N. Y., has been incorporated with a capital stock of $4,000 to manufacture gas and electric fixtures. The incorporators are: Alexander A. Forman, Leon N. Cooper and James M. Gorman.

THE JOHN NEILSON COMPANY of New York, N. Y., has been incorporated with a capital stock of $500 to do a general electrical, hydraulic, mechanical and mining engineering business. The incorporators are: John Neilson, A. E. Walradt and Charles P. Blaney.

THE PIONEER MECHANICAL MINING COMPANY of Pittsburgh, Pa., has been incorporated with a capital stock of $6,000,000 to do a general mechanical and electrical engineering business. The local incorporators are: C. Fearon, K. M. Dougherty and J. Bacon of Wilmington, Del.

THE AMERICAN FORGING COMPANY of Paterson, N. J., has been incorporated with a capital stock of $100,000 to do a general mechanical and electrical engineering business. The plant will be located on South Fifth Street, Lakeview, east of Getty Avenue. Samuel S. Tompkins is agent.

## New England States

ELLSWORTH, ME.—Arrangements have been made by the Bar Harbor & Union River Power Company for improvements to its local power station during the summer, which will include the installation of an additional 3000-kw. generator, replacing the wooden bulkhead at the head of the canal with concrete, etc. J. A. Leonard, engineer, will have charge of the work.

CLINTON, MASS.—Surveys are being made by the New England Power Company of Shelburne Falls for the erection of an electric transmission line from its nearest plant to the mobilization camp to be established at Ayr, to furnish electricity for lighting the camp and for power purposes.

LEOMINSTER, MASS.—The Leominster Electric Light & Power Company has closed its local plant. Energy for operating the system in Leominster is secured from the Connecticut River Power Company.

MALDEN, MASS.—The special committee appointed last fall to make investigations relative to the lighting situation has recommended the establishment of a municipal electric and gas plant.

SPRINGFIELD, MASS.—A bill is now pending in Congress which provides for an appropriation of $90,000 for equipping the Hill plant of the Springfield Armory for electrical operation. It is proposed to install large electric generating units to replace the 450-hp. steam engines now in use.

TURNERS FALLS, MASS.—The town officials are considering a proposal submitted by the Franklin Electric Light Company for the installation of a new street-lighting system to replace the lamps now in use.

WOODBURY, CONN.—The Public Utilities Commission has instructed the Woodbury Electric Light Company to reconstruct its electric distributing system immediately.

## Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, ninth floor, Hall of Board of Education, Fifty-ninth Street and Park Avenue, New York, until May 28 for electric shop equipment and wiring for shop motors in Public Schools Nos. 66, 109, 165, 173, 174 and 175. Further information may be obtained at the above office.

BUFFALO, N. Y.—The International Railway Company of Buffalo is contemplating extensions to its power plant at Niagara and Albany Streets.

BUFFALO, N. Y.—The Public Service Commission has authorized an issue of $1,500,000 of the International Railway Company's bonds, the proceeds to be used to finance extensions and improvements to its system, which will include extensions and additions to power huose and substation equipment, the purchase of 55 new cars, improvements to the equipment of present cars, track reconstruction, etc.

CANANDAIGUA, N. Y.—Negotiations are under way between the City Council and the Ontario Light & Traction Company relative to the installation of an ornamental street-lighting system in Canandaigua.

DUNKIRK, N. Y.—Arrangements are being made by the Niagara & Erie Power Company of Fredonia to exercise provisions of the franchise given by the city to erect station in the town and to furnish electricity to factories and private consumers.

EAST SALAMANCA, N. Y.—Contracts have been awarded by the Buffalo, Rochester & Pittsburgh Railway Company for the erection of new shops at East Salamanca, including machinery and erecting shops, blacksmith shops, storehouse and a transfer table, to cost about $500,000.

FREDONIA, N. Y.—The Village Trustees have authorized the fire and water committee to enter into a contract with the General Electric Company for new street lamps and other equipment, provided satisfactory arrangements are made with the Niagara & Erie Power Company. The lamps will be of 400 cp. and 600 cp.

HARTWICK, N. Y.—The Hartwick Power Company has been merged with the Colliers Light, Heat & Power Company of Cooperstown.

LEBANON, N. Y.—The Earlville (N. Y.) Electric Light Company has petitioned the Public Service Commission for permission to construct an electric-light plant and exercise a franchise in the town of Lebanon, and also for authority to issue $8,325 in bonds.

LYONS, N. Y.—A committee has been appointed by the Lyons Business Men's Association to look into the matter of installing an ornamental lighting system in the business district of the village.

# *Construction*

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEW YORK, N. Y.—Plans have been filed by the New York Edison Company for the erection of a one-story transformer station, 24 ft. by 46 ft., at 454 West Twenty-seventh Street, Manhattan, to cost about $35,000. W. Weissenberger, Jr., is architect.

NEW YORK, N. Y.—The Public Service Commission has approved agreement between the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company whereby the former company will supply power to operate the new subway lines of the Brooklyn Rapid Transit Company in Manhattan for a period of ten years. Agreement was also approved by which the Transit Development Company will supply energy for the Brooklyn Rapid Transit Company in Brooklyn.

THIELLS, N. Y.—Bids will be received by Frank A. Vanderlip, president of board of managers of Letchworth Village, 7 Wall Street, New York City, until May 29, for refrigeration equipment for storehouse, bakery, refrigerating plant and cold storage building, sanitary work and electric service connections for cottages E, F, G and H at Letchworth Village. Plans and specifications may be consulted at Letchworth Village, Thiells, at the office of the board of managers, 7 Wall Street, New York City, at the New York office of the Department of Architecture, Capitol, Albany. Drawings and specifications may be obtained at the Department of Architecture, Capitol, Albany.

WALTON, N. Y.—The Deposit (N. Y.) Electric Company has taken over the plant and holdings of the Southern New York Power Company of Walton.

WATERVILLE, N. Y.—The control of the Waterville Gas & Electric Company has been taken over by B. H. Shepard of Syracuse. The company, it is understood, will be reorganized.

CAMDEN, N. J.—Plans are being considered by the Delaware & Atlantic Telegraph & Telephone Company for the erection of a two-story addition to its telephone exchange building at Fifth and Market Streets, to cost about $38,000.

CLIFTON, N. J.—The City Council has authorized bids to be advertised for lighting the streets of the city.

GLASSBORO, N. J.—The Delaware & Atlantic Telegraph & Telephone Company is planning to install underground cable lines in High Street to replace the present overhead system.

LIVINGSTON, N. J.—The Township Committee has called an election to be held June 5 to make arrangements for a new street-lighting district.

NEWARK, N. J.—Improvements to the municipal fire-alarm telegraph system, including the installation of new underground cable, have been recommended by the Board of Fire Commissioners.

NEWARK, N. J.—Bids will be received by the Passaic Valley Sewerage Commission, 31 Clinton Street, Newark, until June 26 for three 50-kw. engine-driven generator sets, to be installed at the sewerage pumping station on the Kearny meadows. These units will be used to furnish electricity for lighting and screen lifting.

NEWTON, N. J.—Extensions and improvements will be made by the National Utilities Company of Boston, Mass., to its local plant and system and also to its power station at Dover. Harold R. Wilbur of Lambertville is district manager.

PERTH AMBOY, N. J.—The Board of Water Commissioners has adopted a resolution providing for an issue of $200,000 in bonds for extensions and improvements to the municipal water-works, including a new building and new pumping engine, to cost $53,000; new boilers and building, $35,000; dams, spillways, etc.

TRENTON, N. J.—Plans are being considered by the Imperial Porcelain Works, Mulberry Street, Trenton, for the construction of a new plant at Neptune City, to cost about $25,000. The company manufactures electrical porcelain goods.

WESTMONT, N. J.—The Township Committee has granted the Delaware & Atlantic Telegraph & Telephone Company permission to install underground conduit lines in Haddon and Wynnewood Avenues.

BETHLEHEM, PA.—The Bethlehem City Water Company is contemplating the installation of new electrically operated pumping equipment, with a capacity of about 10,000,000 gallons.

CONYNGHAM, PA.—The Harwood Electric Company of Hazleton is contemplating the installation of a distribution system in Conyngham to supply electricity for commercial lighting and power purpose.

GREENSBURG, PA.—The installation of an ornamental street-lighting system in the business district is under consideration.

JOHNSTOWN, PA.—H. D. Walbridge & Company, 14 Wall Street, New York, N. Y., have acquired control of the Citizens' Light, Heat & Power Company. Extension to the plant and system, it is understood, are under consideration.

LANSDOWNE, PA.—Bids are being asked for the erection of a new power plant, 73 ft. by 80 ft., two stories high, in connection with the new building for the new St. Vincent Home at Race and Eighteenth Streets, Philadelphia. Paul Monaghan, Drexel Building, is architect.

MILLERSVILLE, PA.—The Lancaster & York Furnace Railway Company, operating an electric railway from Millersville to Pequea-on-the-Susquehanna, has made arrangements with the Edison Electric Company of Lancaster for energy to operate its system.

PHILADELPHIA, PA.—The Green Box Company, Memphis Street, is contemplating the construction of a power house, 30 ft. by 60 ft., one story, in connection with its new factory addition. W. E. S. Dyer, Land Title Building, is architect.

PHILADELPHIA, PA.—A new boiler house, 49 ft. by 104 ft., one story, will be erected at the power station of the Philadelphia Electric Company, located at Robbins Street and the Delaware River, Tacony. The cost is estimated at about $60,000.

PHILADELPHIA, PA.—Bids are being asked by the Scofield Engineering Company, Commercial Trust Building, Philadelphia, for the erection of a brick and concrete power house and other structures for the Dunnellon Phosphate Company, Fernandina, Fla.

PHILADELPHIA, PA.—Plans have been prepared for the construction of a four-story building, 349 ft. by 78 ft., with a wing 205 ft. by 239 ft., and a power house, 73 ft. by 80 ft., at Lansdowne Avenue and Garret Road for the St. Vincent's Home, Paul Monaghan is architect.

PHILADELPHIA, PA.—Plans have been prepared by Harrison, Mertz & Emlen, engineers, Commercial Trust Building, Philadelphia, for two private water supply systems at Pleasantville, N. J., which provide for the installation of motor-driven deep-well pumping equipment.

PITTSBURGH, PA.—The Central District Telephone Company has acquired a site at Highland and Rural Avenues, on which it will erect a new telephone exchange.

PITTSBURGH, PA.—The Pittsburgh, Harmony & New Castle Railway Company has awarded contract for the construction of a new storage dam and addition to its power plant at Harmony Junction to the Faber Engineering & Construction Company of Pittsburgh.

SCRANTON, PA.—Preliminary plans are being prepared by the Maccar Truck Company for the erection of a one-story power house at its local plant. Duckworth Brothers, Coal Exchange Building, are architects.

SOUTH BETHLEHEM, PA.—Steps have been taken by the Lehigh Navigation Electric Company for the erection of a steel tower electric transmission line between Siegfried and the Bethlehem Steel Company's works.

YEADON, PA.—Plans have been filed for the erection of a power house, 50 ft. by 100 ft., for Theodore Presser, to cost about $30,000. Jesse T. Hoekstra is architect.

BALTIMORE, MD.—Contract has been awarded by the United Railways & Electric Company to the West Construction Company, for the erection of a substation, 60 ft. by 90 ft., at Sollers Point.

SALISBURY, MD.—One of the proposals submitted by the Eastern Shore Gas & Electric Company for lighting the streets of the city has been accepted by the city officials. The new contract, which is for a period of three years, will necessitate the rebuilding of quite a portion of the distributing system.

FARMVILLE, VA.—At an election to be held June 14 the proposal to issue $50,000 in bonds for a municipal electric-light plant, waterworks system and street improvements will be submitted to the voters. The present plans provide for developing 500 kw.

SHENANDOAH, VA.—Bonds to the amount of $30,000 have been voted for the construction of a hydroelectric power plant and filtration system. Plans were prepared by E. V. Dunston, engineer, Washington, D. C.

WASHINGTON, D. C.—Additions are being made to the Bliss Electrical School,

Takoma Park, to cost about $100,000, including the installation of new equipment.

WASHINGTON, D. C.—Bids will be received at the office of the United States Marine Corps, Quartermaster's Department, Washington, D. C., until May 28, for furnishing miscellaneous supplies to be delivered to the depot quartermaster, Marine Corps, 1100 South Broad Street, Philadelphia, Pa., as follows: 8000 flashlight batteries; 1200 electric flashlights complete, with one battery; 100 field telephones, one end with batteries; 25,000 lb. barbed wire, and 20,000 lb. insulated copper wire. C. L. McCawley, brigadier general, is quartermaster.

WASHINGTON, D. C.—The Public Utilities Commission has authorized the Potomac Electric Power Company to issue $1,047,500 in bonds, the proceeds to be used for extensions and improvements as follows: Enlargement of the Benning power plant and installation of a 15,000-kw. turbine, at a cost of $290,000; addition to building at Fourteenth and C streets, $32,000; conduit, $60,750; extension of underground system, $40,125; extension of incandescent, underground street-lighting system, $30,250; extension of overhead system, $25,825; meters, $31,800, and poles and feeders, $15,000.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: San Francisco, Cal., Schedule 1119—75,160 lb. wire fabric. Brooklyn, N. Y., Schedule 1156—miscellaneous common, mercurial; mechanical thermometers, storage battery, etc.; Schedule 1146—55,000 chemical sounding tubes; Schedule 1145—miscellaneous material for switchboard panels; Schedule 1136—one heating and ventilating set (complete); three ventilating sets (complete). Norfolk, Va., Schedule 1139—25 electrolytic, oxygen and hydrogen generators. Philadelphia, Pa., Schedule 1130—indicating and annunciating systems with motor-driven pump; Schedule 1129—two sets motor-driven large plate-bending rolls. Various, Schedule, 1134—miscellaneous electrically driven deck winches. Washington, D. C., Schedule 1159—two motor-driven, back-geared, pillar crank shapers. Application for proposal blanks should designate the schedule desired by number.

## North Central States

ALMA, MICH.—The Central Michigan Light & Power Company of Mount Pleasant has purchased the electric plant and distributing system of the Alma Grain & Lumber Company. The Central Michigan company has begun work on the construction of a new plant on the Pine River in Alma, to cost about $150,000, and has moved its headquarters from Mount Pleasant to Alma.

DETROIT, MICH.—The third unit of the Detroit United Railway Company's shops at Highland Park, consisting of carpenter shop, pattern shop and tinsmithing department, etc., has been completed. The fourth unit to be erected will be a brass foundry. A permanent power and heating plant will complete the layout. The cost of the entire work is estimated at about $1,000,000.

ANTWERP, OHIO.—The Northwestern Electric Light & Power Company of Delphos has applied for a franchise to furnish electrical service in Antwerp.

ELYRIA, OHIO.—Plans are being prepared by the Willys-Overland Company of Toledo for the construction of a boiler house, 30 ft. by 40 ft., at its local plant.

TOLEDO, OHIO.—Plans are being considered by the Central Union (Bell) Telephone Company for the erection of a new telephone exchange building, at Geneva and Arlington avenues, to cost about $110,000, with additional expenditures of $60,000 for outside connecting facilities.

WEST MANSFIELD, OHIO.—The sale of the municipal electric-light plant is reported to be under consideration.

ADAIRVILLE, KY.—The Adairville Lighting Company, recently incorporated, is planning to construct a hydroelectric power plant, to develop 135 hp., on the south fork of Red River, to cost about $15,000. The work will include a concrete dam, 10 ft. by 76 ft., to cost $2,500; power house, $3,200; 3-mile transmission line, $4,500; an urban system connecting Adairville with several small villages and large plantations, $2,350. Contract, it is reported, has been awarded for crude-oil set and urban distribution system.

CAMPBELLVILLE, KY.—The Campbellville Electric Light & Power Company, recently incorporated with a capital stock of $40,000, is planning to install an electric plant, to develop about 125 hp., at a cost of about $40,000.

COVINGTON, KY.—The Eagle Cordage Company is contemplating equipping its plant for electrical operation. Several small motors will be required.

PADUCAH, KY.—The City Commission is considering submitting to the voters a proposal to issue $185,000 in bonds for improvements to the municipal electric-light plant at the next regular election.

FOUNTAIN CITY, IND.—The Town Board is considering a proposal submitted by Charles Wiley, representing the Richmond (Ind.) Electric Company, for the installation of an electric distributing system to supply electricity for lamps, heaters and motors to several towns near Fountain City. W. M. Bailey and others are interested in the project.

GREENSBURG, IND.—The City Council has granted the Greensburg Gas & Electric Company permission to improve the present street-lighting system at a cost of about $1,500.

LIGONIER, IND.—The local electric-light plant, owned by Lyon & Greenleaf, has been purchased by H. L. Crawford & Company of New York, N. Y. No change in management will be made for the present.

PLAINVILLE, IND.—The Indiana Power & Water Company of Bloomfield has applied to the County Commissioners for a franchise to erect electric transmission lines over the roads and highways of Daviess County and to erect an electric-light and power plant and distribution system in Plainville to furnish electrical service to residents in this village and to the inhabitants of the other incorporated districts in the county.

WINONA LAKE, IND.—The Public Service Commission has granted the Winona Electric Light & Water Company permission to issue $85,000 in bonds, the proceeds to be used for improvements and other purposes.

CHICAGO, ILL.—Bids will be received by the clerk of the Sanitary District of Chicago, 700-910 South Michigan Avenue, Chicago, until May 31 (extension of date), for furnishing a vertical hydraulic turbine and an alternating-current generator. For details see proposal columns.

ELGIN, ILL.—The old Waverly mill in Elgin is reported to have been purchased by B. S. Pearsall. The new owner, it is understood, proposes to install a hydroelectric plant.

EL PASO, ILL.—Beaudett & Croner of El Paso are contemplating enlarging their cold storage plant and installing additional machinery, at a cost of about $10,000.

EMINGTON, ILL.—Plans are being considered by the Town Board for the installation of an electric-lighting system.

RUSHVILLE, ILL.—Bids will be received by the Commissioners of Kelly Lake Drainage & Levee District, at the office of Glass & Bottenberg, attorneys, Rushville, until June 1, for furnishing and erecting any or all parts of an electrically driven pumping plant. For further information address the Jacksonville (Ill.) Engineering Company. Specifications will be furnished upon receipt of $3.

BARABOO, WIS.—Surveys have been completed for the erection of an electric transmission line from the power house at Prairie du Sac to Baraboo.

BROOKLYN, WIS.—Permission has been granted to the Brooklyn Electric Company by the Railroad Commission to use the poles of the Brooklyn Telephone Company for erecting wires for an electric distributing system in Brooklyn. H. J. Ellis is interested in the Brooklyn Electric Company.

NEENAH, WIS.—Plans are being considered for replacing the steam power plant at the water-works station with electrically operated machinery.

RACINE, WIS.—Plans are being prepared by the Milwaukee Light, Heat & Traction Company for the construction of an addition to its local plant to cost about $25,000.

RIPON, WIS.—The Ripon Light & Water Company has purchased the electric plants and holdings of the Wisconsin Light, Power & Milling Company in Eldorado and Rosendale, which include the power plant in Eldorado and 5 miles of transmission line. It is proposed to erect transmission lines from Ripon to Rosendale.

SHAWANO, WIS.—The Electric Light and Waterworks Commission has recommended improvements to the municipal water and light plant, including the installation of a 250-hp. Corliss engine, directly connected, and motor-driven pumps.

SPARTA, WIS.—The Wisconsin-Minnesota Light & Power Company, which recently purchased the electric-light and power plants at Sparta and Angelo of the O. I. Newton Sons Company, is planning to erect an electric transmission line to connect the plant in this city with the power station in La Crosse. The plans provide for the erection of 90 miles of transmission lines, connecting Sparta, Tomah, and La Crosse with the plant at Nelson. A transmission line is now being erected from the local plant to Tomah. The power plant at Nelson, the Wisota dam, will be enlarged this year, increasing the output from 22,000 to 45,000 hp.

WAUSAU, WIS.—The Wisconsin Railroad Commission has granted the Wisconsin Valley Electric Company permission to issue $1,337,500 in bonds. Of the proceeds $564,000 will be used to refund bonds of the Wausau Street Railroad Company and notes of the Wisconsin Valley Electric Company, and the balance to provide funds for new construction.

AURORA, MINN.—Bids will be received by W. J. Rashleigh, clerk, the Independent School District No. 13, Hearding School Building, Aurora, until June 12, for construction of high school buildings, separate bids to be submitted on general contract, electrical work, heating and ventilating, temperature regulation, fans, motors, drives and heaters, air washers and humidity control equipment, and vacuum heating equipment. Plans and specifications are on file in the office of the architects, 320 Auditorium Building, Minneapolis, Minn., and at the office of the Board of Education, Aurora.

MARSHALL, MINN.—Bids will be received at the office of the city recorder, Marshall, until June 4 for furnishing one 150-hp. or 200-hp. engine or turbine directly connected to an engine-type generator. Generator to have a rating of 125 or 150 kw., 60 cycle, 2300 volts, three-phase, belted to a direct-current exciter. A. G. Bumford is city recorder.

BURLINGTON, IOWA.—The Board of Railroad Commissioners has granted the Peoples Gas & Electric Company of Burlington a franchise to erect electric transmission lines on the roads and highways between Morning Sun and Mediapolis, in Louisa and Des Moines Counties, to supply electricity for lamps and motors in this territory.

CENTERVILLE, IOWA.—The Iowa Southern Utilities Company of Centerville has been granted a franchise by the Board of Railroad Commissioners to erect electric transmission lines on certain roads and highways in Ringgold and Taylor Counties, to supply electricity for lamps and motors in this district.

CENTERVILLE, IOWA.—Bids will be received by the Board of Education of Centerville until June 5 for construction of high school building, including electric wiring, heating, plumbing, vacuum cleaner, etc. The cost of the building is estimated at about $150,000. M. B. Cleveland, 603 First National Bank Building, Waterloo, is architect.

CLINTON, IOWA.—Improvements, it is reported, are contemplated by the Illinois Railroad Company to its local yards, including a new power house, extensions to machine shops and improvements to the roundhouse, etc. The cost is estimated at $250,000.

FORT DODGE, IOWA.—Extensions and improvements involving an expenditure of $250,000, it is reported, are contemplated by the Fort Dodge, Des Moines & Southeast Railway Company.

MANSON, IOWA.—At an election held recently the proposal to issue bonds for the construction of an electric lighting and heating plant was carried.

WAPELLO, IOWA.—The electric plant of the Wapello Electric Light & Power Company, owned by the Burlington (Iowa) Railway & Light Company, was destroyed by fire on May 8, causing a loss of about $10,000. Two electric generators and two engines were completely destroyed. The three boilers may be repaired. An electric transmission line may be erected from Burlington to furnish temporary service. The plant, it is understood, will be rebuilt.

WATERLOO, IOWA.—The Board of Railroad Commission of the State of Iowa has granted the Cedar Valley Hydraulic Company of Waterloo a franchise to erect and operate electric transmission lines in Floyd County, from Charles City to Rockford, to supply electricity for lamps, heaters and motors.

KANSAS CITY, MO.—The city officials are seeking information on standards and equipment for illuminated street signs. It is proposed to mark all downtown streets and as many of the outside corners as possible. The cost of the work is estimated at about $50,000.

SPRINGFIELD, MO.—At an election to be held June 16 the proposal to issue $500,000 in bonds will be submitted to the voters.

VANDALIA, MO.—The Walsh Fire Clay Products Company contemplates equipping a power plant and installing clay-working machinery, at a cost of about $500,000. The Unit Construction Company of St. Louis will have charge of the engineering work.

BEACH, N. D.—The electric plant of the Beach Electric Company has been purchased by F. C. Hughes of the Glendive (Mont.) Heat, Light & Power Company.

FARGO, N. D.—Bids will be received by E. G. Guthrie, secretary board of education, Court House, Fargo, N. D., until June 4, for the construction of a school building. Separate bids to be submitted for general contract, heating and electrical work, plumbing, etc. Plans and specifications can be seen at the office of Haxby & Braseth, architects, Fargo.

FORBES, N. D.—Plans are being considered for the installation of a municipal electric-light plant. It is proposed to erect an electric transmission line from Ellendale to Forbes.

STEELE, N. D.—Local business men have organized a stock company and have purchased the property of the Goodwin Light & Power Company. The new company will be known as the Steele Electric Company and will be capitalized at $20,000. E. B. Miller, H. B. Allen and J. C. Loerch are among the incorporators.

VALLEY CITY, N. D.—The City Council has entered into a contract with the Dakota Engineering & Construction Company for furnishing energy to be taken at the city limits for a period of 20 years. The service will be furnished over a high-tension line, 35 miles long, connecting the villages of Sanborn, Rogers and Daxey. A 24-hour service will be given.

CHESTER, S. D.—The local electric-lighting system has been purchased by the Hartford (S. D.) Light & Power Company. An electric transmission line will be erected from Hartford to Chester, a distance of 4 miles. The Hartford company purchases energy from the Northern States Power Company.

HAVELOCK, NEB.—The contract for electric wiring for the new high school in Havelock has been awarded to the Capital City Electric Company of Des Moines, Iowa, at $4,175.

ABILENE, KAN.—The Riverside Light, Power & Gas Company is contemplating extensions to its system.

HAYS, KAN.—Plans are being prepared for improvements to the municipal electric-light plant and water-works system, to cost about $25,000. E. T. Archer & Company, New England Building, Kansas City, Mo., are engineers.

KENSINGTON, KAN.—Improvements are being considered for the municipal electric-lighting system.

NESS CITY, KAN.—Bids will be received by the County Commissioners of Ness County at the office of the county clerk, Ness City, until June 5, for the erection of a court house in Ness City, as follows: (1) For building complete exclusive of heating, plumbing and electric wiring; (2) electric wiring, heating and plumbing. Plans and specifications are on file in the office of J. C. Holland & Son, architects, Topeka, Kan.

SALINA, KAN.—Plans are being considered by the city officials and the Salina Light, Power & Gas Company for lighting the city park.

TORONTO, KAN.—Bids, it is reported, will soon be awarded for the construction of an electric-light plant. W. B. Rollins & Company, 209 Railway Exchange, Kansas City, Mo., are engineers.

## Southern States

ANDERSON, S. C.—The Southern Public Utilities Company of Charlotte, N. C., has been awarded the contract for installing a new street-lighting system in the Orr cotton mill village. The 12 arc lamps now in use will be replaced with 83 Mazda lamps of 80 cp.

JEFFERSON, S. C.—The State Legislature has granted the city of Jefferson permission to issue $15,000 in bonds for a municipal electric-light plant and water-works system.

GAINESVILLE, GA.—The Southern Bell Telephone & Telegraph Company is contemplating the erection of an exchange in Gainesville, to cost about $13,000, and other improvements to cost about $40,000, including the removal of wires from the public square and the installation of common battery system.

THOMASVILLE, GA.—At an election held recently the proposal to issue $160,000 in bonds for improvements to the electric-light plant, fire-alarm system, water-works system, paving, etc., was carried.

CHATTANOOGA, TENN.—The Lucey Manufacturing Company is reported to be contemplating the erection of a power house, to cost about $6,500.

CARRVILLE, ALA.—The proposal to issue bonds for the installation of a transformer station and the erection of an electric transmission line from the plant of the Montgomery (Ala.) Light & Water Power Company to Carrville, a distance of 3 miles, will be submitted to the voters.

DOTHAN, ALA.—The City Council has entered into a provisional contract with the South Alabama Power Company whereby the latter will furnish the city with hydroelectric power from O'Mercer Creek. The company proposes to develop the water power of O'Mercer Creek and transmit the energy to Dothan to be distributed by the municipal plant.

MONTEVALLO, ALA.—The Montevallo Mining Company is planning to install a continuous coal conveyor and to make other improvements.

FERNWOOD, MISS.—Arrangements have been completed by the McComb-Magnolia Light & Railway Company of McComb with the Fernwood Lumber Company for the purchase of a site for the erection of an electric power plant in Fernwood.

GULFPORT, MISS.—The Gulfport & Mississippi Coast Traction Company, it is reported, contemplates purchasing equipment to convert boilers now using coal to wood burning. The company is also in the market for machinery to handle slabs and other saw mill refuse.

NATCHEZ, MISS.—Contract has been awarded to Brown & Henderson of Natchez for the construction of an electric plant for the Jefferson Military College.

PICKERING, LA.—The W. R. Pickering Lumber Company is planning to rebuild its sawmill and power plant, recently destroyed by fire, causing a loss of about $100,000. New equipment will be installed.

BILLINGS, OKLA.—Bonds to the amount of $10,000 have been voted for improvements to electric-lighting system.

BRISTOW, OKLA.—The plant and holdings of the Bristow Ice & Light Company have been purchased by J. J. and D. O. Darnell of Cripple Creek, Col. The new owners, it is understood, contemplate improvements to the system.

FREDERICK, OKLA.—The city of Frederick has taken over the electric plant of the Foster-Harris Gin & Electric Company, at a valuation of $35,000, which will be operated in connection with the water-works system. Service extensions are contemplated.

WAYNOKA, OKLA.—Bids are being asked by the city of Waynoka for alternating-current generators directly connected to oil-burning engines and other electrical equipment.

KINGSVILLE, TEXAS.—We are informed that the St. Louis, Brownsville & Mexico Railroad Company does not contemplate the installation of an electric-light and power plant as reported in the issue of April 21. The Texas Gas & Electric Company furnishes electrical service to local shops and terminals of the railroad company.

ODESSA, TEX.—The Odessa Light & Power Company, recently incorporated with a capital stock of $4,000, is planning to construct an electric-light plant in Odessa. R. M. Henderson, W. F. Bates and W. H. Rhodes are the incorporators.

## Pacific and Mountain States

KEYPORT, WASH.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded the contract for alterations, etc., to the heating and power plant at the naval station at Keyport, to Charles C. Moore & Company of Seattle, Wash., at $27,803.

OKANOGAN, WASH.—A three-year contract between the Okanogan Valley Power Company and the United States Reclamation Service for power from the No. 2 power plant, near Okanogan, has been signed, and will take effect as soon as the water is turned on. Power to be used through the irrigating season. Connections will be made immediately between the Okanogan company and the Government lines. Electricity from this plant will be supplied to the towns of Okanogan, Omak and Riverside, while the Pateros plant of the company will furnish energy in Pateros, Brewster, Bridgeport and Mansfield.

OLYMPIA, WASH.—The Puget Sound Traction, Light & Power Company of Tacoma has petitioned the County Commissioners for a franchise to erect an electric transmission line between Nisqually and Log Cabin, near Tumwater. The proposed line would furnish additional energy to the Olympia Light & Power Company for use largely at the shipyards.

SPOKANE, WASH.—Plans have been approved by the Pacific Telephone & Telegraph Company for the erection of toll lines in the Inland Empire, involving an expenditure of $77,600. The work will include the erection of a phantom circuit from Colfax to Spokane, a distance of 59 miles; also stringing copper wire and establishing a phantom with an existing circuit from Colfax to Thornton, and dismantling an existing pole line and circuit from Oakesdale to Thornton Junction.

PORTLAND, ORE.—The City Council has refused to submit to the voters at the election to be held June 4 the proposal of Commissioner Daly to issue $1,777,000 in bonds for the installation of a hydroelectric power plant on Bull Run Lake.

FRESNO, CAL.—The State Railroad Commission has approved the application of the San Joaquin Light & Power Company for an indenture securing $4,500,000 in debentures. The commission has authorized the company to issue $1,000,000 in bonds at not less than 95, the proceeds to be used to reimburse treasury for capital expenditures which have been made for new improvements.

LOS ANGELES, CAL.—The City Council has given its approval of the plans for the installation of the new ornamental lighting system on Broadway, which will extend from the tunnel to Tenth Street, a distance of about 72,000 ft. The plans provide for the erection of 136 standards, 25 ft. high, each mounted with two lamps. The system will be installed under the supervision of William D'Arcy Ryan of New York, illuminating engineer.

STOCKTON, CAL.—The Western States Gas & Electric Company has filed an application with the State Water Commission for permission to appropriate waters of Medley and Echo Lakes in El Dorado County and Twin Lakes in Alpine County, for power purposes. The quantity of water applied for is 5000, 7000 and 8000-acre-ft., respectively. It is proposed to develop 2500 hp. at the existing plant of the American River Electric Company for a period of seven months in the year. The proposed main ditch, including penstocks, is to be 7.3 miles long. At Medley Lake it is proposed to erect a main dam 15 ft. high and two auxiliary dams 5 ft. each in height, and at Echo Lake a tunnel driven to draw the level of the lake about 40 ft. below the natural outlet, said tunnel to be 5 ft. by 6½ ft. in cross section and 2600 ft. long. The total fall to be utilized is given as 610 ft. from dam to waterwheel.

BOISE, IDAHO.—Application has been made to the Public Utilities Commission by the Beaver River Power Company of Boise for permission to extend its electric transmission lines to Marysvale. The company, it is understood, proposes to erect a new plant at Panguitch.

BOISE, IDAHO.—The State Land Board has decided to take up the question of having the Utah Power & Light Company supply energy in bulk to the Ashton & St. Anthony Power Company, so that the latter company can furnish electricity to operate the pumps of the Owsley irrigation project.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has petitioned the City Commission for permission to construct an underground vault in Main Street. The object of the station is to improve the service in the business district.

BUTTE, MONT.—Permits have been granted the Butte Electric Railway Company for the construction of two substations, one to be erected at Florence and Major Streets, to cost $1,700; the other at 218 East Center Street, to cost $2,400.

PUEBLO, COL.—Plans have been completed by the city engineer for a new lighting system on Broadway, Quincy and Jackson streets in the new Pacink District No. 1. The plans provide for the installation of ornamental standards in the center of the intersection of the streets in the district.

## Canada

LETHBRIDGE, ALTA.—The Ellison Milling Company is contemplating erecting an elevator, to cost between $100,000 and $150,000.

ST. JOHN, N. B.—The contract for the construction of the new laundry and power house for the General Public Hospital has been awarded to Robert A. Corbett, con-

tractor, for $19,900. The laundry will be equipped with electrically operated machinery.

ALYMER, ONT.—A by-law providing for an appropriation of $22,000 for remodeling the electrical distribution system in Alymer to distribute energy to be supplied by the Hydro-Electric Power Commission of Ontario and $7,000 for the installation of an electrically operated pump to supply water for domestic purposes and a gasoline pump for fire purposes has been approved by the ratepayers.

BRANTFORD, ONT.—The Township Council has instructed the township solicitor to prepare a by-law providing for the township entering into a contract with the Hydro-Electric Power Commission of Ontario to furnish electricity to be distributed throughout the township.

HOWARD TOWNSHIP, ONT.—Plans are being considered for the installation of a hydroelectric system in Howard Township.

MARKHAM, ONT.—The Markham Board of Trade has passed a resolution urging the Hydro-Electric Power Commission of Ontario to extend its system to Markham.

SCARBORO, ONT.—The Township Council has passed a by-law authorizing the Hydro-Electric Company to erect street lamps on the Kingston Road from the city limits to the Kennedy Road, and on Danforth Avenue from the city limits to a point a mile out.

COATICOOK, QUE.—The Foundation Company of Montreal has been awarded the contract for the construction of a dam and penstock for Penmans, Ltd., in connection with a hydroelectric development of about 180 hp.

EAST ANGUS, QUE.—Plans are being considered by the Brompton Pulp & Paper Company for the construction of a dam and power house at East Angus. The equipment will include electrical equipment, waterwheels, turbines, generators and switchboard. The Montreal Engineering Company, 164 James Street, Montreal, has charge of the engineering work.

## Miscellaneous

PANAMA.—Bids will be received by the general purchasing officer, the Panama Canal, Washington, D. C., until May 29 (under proposal 2129) for furnishing 2300 ft. bronze wire, 8000 ft. brass chain, 1750 snap switches, 250 push buttons, six hand pumps, etc. For further information address Major Earl I. Brown, general purchasing officer.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until June 9, for furnishing (under proposal 1146) 500 spark plugs, one band saw, milling outfit, 2000 ft. galvanized seizing wire, 3000 lb. galvanized steel wire, two sail makers machines, motor driven, and two motors; 3400 ft. electric cable, 48 kerosene fire pots, 144 burner plugs, 24 fuller caps, 2500 outlet boxes, 750 caps for plugs, 100,000 ft. conduit, oak, yellow pine, box car siding, redwood, poplar, hickory and fir. For further information address Major Earl I. Brown, general purchasing officer.

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1,225,738. INSULATOR FOR HIGH-TENSION CONDUCTORS; Albert Aichele, Baden, Switzerland. App. filed Nov. 25, 1913. Surface in the vicinity of the socket is so shaped that the electric field is directed almost at right angles to the insulator surface so that glow discharge along the surface is prevented, and thus the tension at which the spark passes is increased.

1,225,820. ELECTRIC SWITCH; Charles F. Kettering and Robert S. De Maree, Dayton, Ohio. App. filed July 14, 1913. Controller switches.

1,225,826. ELECTRICAL HEATING UNIT; Frank Kuhn and Frank E. Shailor, Detroit, Mich. App. filed May 8, 1915. Improvements.

1,225,827. ELECTRIC HEATING UNIT; Frank Kuhn and Frank E. Shailor, Detroit, Mich. App. filed Oct. 15, 1915. For use in connection with electrically heated ovens.

1,225,887. VALVE-OPERATING MECHANISM; John H. Swan, Chicago, Ill. App. filed July 22, 1915. Motor having a double action, the primary action being utilized for actuating the valve and the secondary action being utilized for adjustment of the controlling means for the motor.

1,225,890. FUSE PLUG; Henry von P. Thomas, Kirkwood, Mo. App. filed May 15, 1916. Improvement.

1,225,901. HIGH-TENSION SWITCH; Ernst Weissberg, Cassel, Germany. App. filed June 10, 1914. Cut-out with means for extinguishing the arc set up on breaking the circuit.

1,225,963. MOTOR-CONTROL APPARATUS; Frederick Hymans, Glen Ridge, N. J. App. filed Oct. 20, 1914. Used in the operation of furnace hoists, etc.

1,225,975. MERCURY MOTOR METER; Robert C. Lanphier, Springfield, Ill. App. filed March 12, 1913. Auxiliary damping devices heretofore employed are dispensed with.

1,225,976. ELEVATOR-CONTROL SYSTEM; David Larson, Berlin, Germany. App. filed July 30, 1912. For automatic alternating-current electric elevators.

1,225,997. PANELBOARD AND LINING-STRIP SUPPORTING MEANS; Edwin A. Olley, Syracuse, N. Y. App. filed June 14, 1913. Improved.

1,226,009. BURGLAR ALARM; Charles Rieser, Chicago, Ill. App. filed Sept. 3, 1915. Portable.

1,226,017. INCLOSED FUSE; George A. Schaefer, Chicago, Ill. App. filed April 23, 1914. Link may be readily inserted between the terminals of the fuse without the use of special tools.

1,226,056. ELECTRICAL MEASURING INSTRUMENT; William M. Bradshaw and Walter G. Mylius, Wilkinsburg, Pa. App. filed Nov. 28, 1913. Friction compensating means therefor.

1,226,058. ELECTRICALLY CONTROLLED CALCULATING MACHINE; James W. Bryce, Bloomfield, N. J. App. filed April 12, 1916. Improvements.

1,226,067. AUXILIARY APPARATUS FOR VAPOR CONVERTERS; Earl E. Eby, Winkinsburg, Pa. App. filed Oct. 21, 1916. Both the control of a keep-alive arc within the container and the flow of gas through an exhaust tube therefor may be effected.

1,226,069. ANODE STRUCTURE FOR VAPOR CONVERTERS; Sidney W. Farnsworth, Pittsburgh, Pa. App filed July 12, 1915. Anode that shall be free from leaks, that shall produce and maintain a suitable rectifying arc without the liberation of occluded gases, and the temperature of which may be readily adjusted.

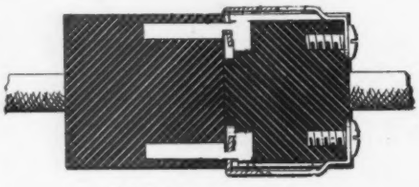
## *Record of Electrical Patents*

**Notes on United States Patents issued on May 15, 1917**

1,226,091. ALTERNATING-CURRENT INDUCTION MOTOR; Burton McCollum, Washington, D. C. App. filed Aug. 2, 1915. Yields a high starting torque with a relatively low starting current, and will also operate under load conditions with good efficiency and small speed regulation.

1,226,114. CIRCUIT INTERRUPTER; Karl C. Randall, Edgewood Park, Pa. App. filed April 6, 1914. Provides means for conducting the generated gas away from the contact members and for utilizing the gas in aiding the operation of the circuit interrupter.

1,226,122. ELECTRIC FURNACE AND METHOD OF PRODUCING MOLTEN MAGNETITE THEREIN; Arthur P. Scott, Chicago, Ill. App. filed Nov. 17, 1915. Improvements in single-phase alternating-current electric furnaces of the direct-arc type.



1,226,161—Connector

1,226,142. VOLTAGE-REGULATING SYSTEM; Norman W. Storer, Pittsburgh, Pa. App. filed Jan. 7, 1914. For maintaining substantially constant voltage upon translating devices, such, for instance, as the lamps which are commonly employed in electric railway cars.

1,226,151. REFILLABLE CARTRIDGE FUSE; Louis E. Weinberg, New York, N. Y. App. filed May 28, 1914. Permanent outer casing with a replaceable inner inclosed fuse.

1,226,161. CONNECTOR; Stanley Anthony, Boston, Mass. App. filed Sept. 24, 1913. Locks together in such a manner that accidental disconnection cannot occur.

1,226,255. MOTOR-CONTROLLING DEVICE; John Richmond, Rochester, N. Y. App. filed Jan. 8, 1914. Provision is made for automatically reversing the direction of operation of a motor intermittently by means of a continuously rotating controller.

1,226,264. ELECTRIC FURNACE; Frank C. Schmitz, New York, N. Y. App. filed Nov. 3, 1913. Water-cooled type.

1,226,279. PROCESS OF ELIMINATING AND RECOVERING ACIDS OR METALLIC SALTS; Harold E. Tiffany, Newark, Del. App. filed Jan. 5, 1916. Consists in the application of electrolysis or an electrolytic method to the washing or purifying of fiber or similar material in sheet, tube or other form for the elimination of any metallic salt.

1,226,290. STORAGE BATTERY; Theodore A. Willard, Cleveland, Ohio. App. filed July 6, 1915. Means for sealing the terminal posts to prevent creepage of battery solution upward along the posts to the exterior of the cover.

1,226,319. OIL VAPORIZER FOR EXPLOSIVE ENGINES; Charlie W. Dyer, Stratton, Me. App. filed July 27, 1916. Engine starters.

1,226,338. LAMP-SOCKET LOCK; Herbert R. Land, Little Rock, Ark. App. filed Jan. 11, 1917. Readily applied to the conventional forms of lamp sockets.

1,226,350. MECHANISM FOR WELDING PIPE BY ELECTRICITY; Clarence Mark and Carl O. Bergman, Evanston, Ill. App. filed Sept. 11, 1914. Electrically heating the edges of the blank so that when these edges have been raised to a sufficiently high temperature the blank is passed through forming and finishing rolls.

1,226,404. SWITCH; Alexander K. Sutherland, New Britain, Conn. App. filed Oct. 28, 1916. Rocking or oscillating switches of the push-button type.

1,226,406. ALTERNATING-CURRENT SYNCHRONOUS MOTOR; Robert W. Swift, Warren, Ohio. App. filed Dec. 4, 1914. Equipped with means for causing the rotor to operate in exact synchronism with the alternations of the current and to avoid lagging or slippage of the rotor relative to the pulsations of the current.

1,226,433. CURRENT TAP; William R. Young, Bridgeport, Conn. App. filed Jan. 30, 1917. Combined tap and receptacle affording connecting means for a plurality of attachment plugs.

1,226,451. ELECTRIC CONTROLLING AND FEEDING APPARATUS; Sidney B. Blakely, Chicago, Ill. App. filed Dec. 29, 1915. Improvements.

1,226,471. REFRACTOBY-METAL TUBE; William D. Coolidge, Schenectady, N. Y. App. filed Feb. 5, 1916. Improvements.

1,226,491. ELECTRIC METER; Alexander J. R. Fiego, Lynn, Mass. App. filed March 20, 1914. Simplifies the mounting for the ratio or reduction gearing of electric meters.

1,226,500. WATER EXPLOSION ENGINE; Gustav Fuehler, Verdon, S. D. App. filed Aug. 9, 1916. The engine is so arranged that upon the introduction of water into the cylinder the water bursts into steam and drives the usual piston.

1,226,534. ELECTRIC LOAD DISTRIBUTER; Jess E. King, Syracuse, N. Y. App. filed April 29, 1916. Responsive to small variations in the load required and capable of very close regulation so that the power taken from the primary source of supply may be kept practically constant.

1,226,546. AUTOMATIC MOTOR CONTROLLER; Lewis J. McDowell, Brooklyn, N. Y. App. filed Feb. 27, 1915. Improvements.

1,226,558. ELECTRIC-LAMP HOLDER; Victorino Martinez, Havana, Cuba. App. filed April 15, 1916. New arrangement of terminals and properly forms a unipoplar circuit breaker.

1,226,584. CUT-OUT; Henry T. Paiste, Philadelphia, Pa. App. filed Sept. 9, 1915. Improvements.

1,226,617. ELECTROMAGNET; Frederick R. Parker, Chicago, Ill. App. filed Sept. 23, 1916. Improvements.